

**Karachi Institute of Economics and Technology, Karachi**

**SELF ASSESSMENT REPORT**

**BE Mechatronics Engineering Program**

**Department of Mechatronics Engineering**

**Submitted to**

**EAB / EA&QEC Pakistan Engineering Council**



**October 2021**

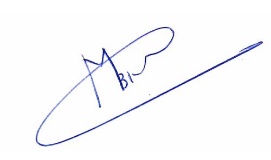
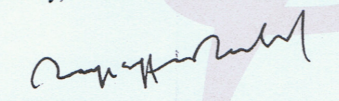
**Subject: SAR for the Program of BE Mechatronics Engineering**

1. The requirements as per the Check List below to qualify for the process of accreditation under the PEC OBA Manual of Accreditation-2014 have been addressed / verified:

Check List:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Qualifying Requirement** | **HEI**  **Check**  **/Remarks** | **PEC**  **Check**  **/Remarks** |
| (i) | Applicant institution must satisfy the legal status/requirement of the relevant bodies, specifying the particular legal arrangements as a Charter / Degree Awarding Institution (DAI), Constituent or Affiliated institution, or any other type, etc. |  |  |
| (ii) | A minimum of 128 credit hours of which minimum of 65% credit hours must be from core engineering courses offered over a period of four years (8 semesters) |  |  |
| (iii) | Final year project (minimum 6 credit hours) |  |  |
| (iv) | Full-time engineering faculty (minimum of 8), and matching student-faculty ratio of 25:1 |  |  |
| (v) | Progress on / Compliance Report on the last PEC visit observations / EAB decision. |  |  |
| (vi) | Summary of initiatives to adopt Outcome Based Assessment (Program Learning Objectives and Outcomes) |  |  |
| (vii) | Duly completed and signed SAR as per prescribed format. |  |  |

1. The Self-Assessment Report (SAR) is hereby submitted for consideration of PEC EA&QEC/EAB to process for accreditation of the program of BE Mechatronics Engineering, Batch(es) 2015 and Onwards Sessions.

Signature:  Signature: \_ Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_

(Head of the Deptt.) (Dean/Head of the Institution) (Accreditation Deptt., PEC)

Date: \_\_29-10-2021\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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# Introduction

This document is the Self-Assessment Report (SAR) for the BE Mechatronics Engineering Program offered by Mechatronics Engineering Department under College of Engineering (CoE), PAF-Karachi Institute of Engineering and Technology (KIET) (Main Campus, Korangi Creek

Karachi). It is prepared as per guidelines of the Pakistan Engineering Council (PEC) Manual of

Accreditation Second Edition 2014. This SAR covers all aspects of Outcome Based Education (OBE) including 9 criteria of accreditation implemented in the program. This section provides introduction of KIET and Mechatronics Engineering Department. Moreover, it also describes BE Mechatronics Engineering Program Accreditation history, history of conversion into Outcome Based Education System and Quality Assurance hierarchy.

## About KIET

Pakistan Education Foundation (PEF) is the founder of Karachi Institute of Economics and Technology (KIET). In 1997, PEF was established and registered under the Societies Act of 1860. KIET started in 1998 under the auspices of PEF with an aim to provide quality education at affordable cost in the fields of Engineering and Technology, Computer Sciences & Information Technology, Business Administration and other disciplines.

KIET is recognized by HEC vide letter no. 15-22/UGC-SEC/97/1291 dated August 1, 1998 and was awarded a degree granting status through a charter vide Ordinance V 2000 by the Government of Sindh on May 24, 2000.

Since September 2000, Pakistan Air Force is also providing patronage to the institute in accordance with a collaboration agreement between Pakistan Air Force (PAF) and Pakistan Education Foundation (PEF).

College of Engineering- a constituent college of KIET, was launched in Fall 2003 with an aim to develop professional engineers capable of meeting industry needs of both national and international engineering sectors.

KIET is offering engineering programs with the approval of Pakistan Engineering Council (PEC).

## Location of KIET

The Institute has three campuses:

1. KIET, Main Campus

PAF Base Korangi Creek, Karachi-75190

Tel: 35091114-7, 35092324, 35092329 -30

Fax: 35091118

Email: kiet@pafkiet.edu.pk

1. KIET City Centre

28-D, Block-6, P.E.C.H.S., Karachi

Tel: 34543280 (6 Lines)

Fax: 34546872

Email: pafkietcity@pk.netsolir.co

1. KIET North Nazimabad Campus

F-98, Block B, North Nazimabad, Karachi-74700

Ph :(9221) 36628381- 36679314

Cell: 0336-2444191-92

Email: directornn@pafkiet.edu.pk

## KIET Organizational Setup

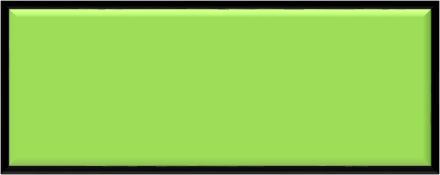
The President (Vice Chancellor) being the chief executive of KIET performs his functions in accordance with the charter and general policy guidelines laid down by Board of Governors (BoG) of the Institute. The management organogram can be viewed below:



**Chancellor**



**President**



**Dean (Academics)**



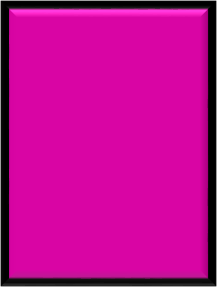
**Director CoE**



**Marketing**

**&**

**Admission**



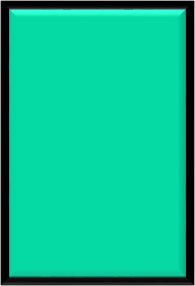
**C.F.O**

**Chief**

**(**

**Finance**

**Officer)**

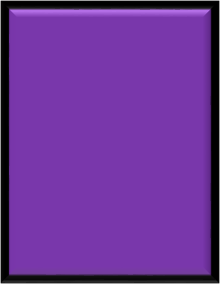


**Corporate**

**Services &**

**Industrial**

**Liaison**



**Registration**

**&**

**Examination**



**Management**

**Information**

**System**



**Quality**

**Enhancement**

**Cell**



**HoD Avionics**



**Director CoCiS**



**Director CoMS**



**HoD Electrical**



**HoD**

**M**

**echatronics**

Figure The Management Organogram for KIET

## Accreditation History

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **S No.** | **Visit Date** | **Visit Type** | **Intake Batches Under Evaluation** | | | **Decision of PEC** | **Ref &Date** |
| 1 | 09 – 10 Mar, 2018 | Accreditation  (Mechatronics  & Avionics) | SP 14 | SP 15 | SP 16 | Accreditation granted to SP 14 Intake | PEC/AD/PAFKI ET-K/D L84 12017  06Dec 2017 |
| 2 | 30 - 31 Jan  & 01 Feb ,  2019 | Re-  Accreditation  (Mechatronics) | SP 15  SP 16 | SP 17 | SP 18 | Re-accreditation granted up to SP 16  Intake   * SP 15 Level-   I   * SP 16 Level-   II | PEC/EAD/KIE  T-K/DL92/2019  17 Jun 2019 |
| 3 | 1 – 2 Oct 2021 | Re-  Accreditation  (Mechatronics) | SP 17 | SP 18 | SP 19 | Re-accreditation granted up to SP 18  Intake   * SP 17 Level-   II   * SP 18 Level-   II | Minutes of the Meeting 103th EAB Meeting held on October 18, 2021 at PEC HQ, Islamabad |

**Table 1 Accreditation / Re-accreditation Status: BE Mechatronics**

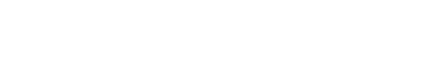
## Quality Assurance Hierarchy

The University has a Quality Enhancement Cell (QEC) and the Mechatronics Engineering Department has various statutory bodies and several internal mechanisms which are responsible for monitoring, evaluation and improvement of the quality of the program. The Department has several internal committees namely the Teaching Interest Groups, Folder Management Committee, External Senior Design Project (SDP) Review Committee, Internal and External Audit Committees which regulate the CQI of the program at PLO/CLO level respectively and the various assessment procedures adopted by the faculty of the Department. The data at PEO level is managed by the Corporate Relations and Industrial Liaison Department which compiles the data, and is first assessed by the QEC before sharing with the Department. The recommendations made are approved by the Board of Studies (BoS) at PLO/CLO level) and Board of Faculty (BoF) (at PEO level). The curriculum revision, if required, is proposed by the Curriculum Advisory Board which has industry input as being one of the key stake holders in the OBE system. The BoF gives recommendations on the proposed curriculum that are passed on to the academic council which gives the final approval of the curriculum. The QEC Hierarchy is shown in the below mentioned diagram.

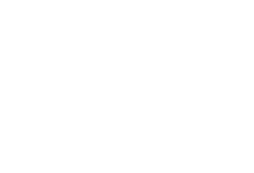
## Board of Studies

The Board of Studies meets multiple times (depending upon the departmental requirement) every semester to deliberate on and resolve academic issues. The Board comprises of the following members:

* Director College of Engineering
* Head Curriculum Review
* Departmental Head
* Area Specialists (As required)



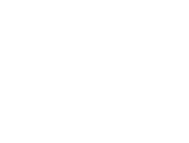
**ANALYSIS/ASSESMENT**



**Folder**

**Maintenance**

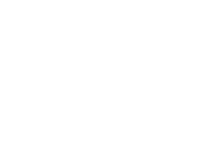
**Committee**



**External**

**Academic**

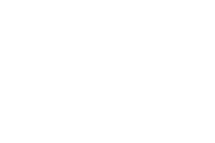
**Audit**



**Internal**

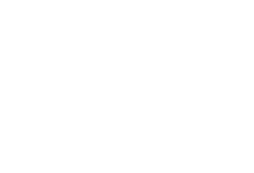
**Academic**

**Audit**



**Student**

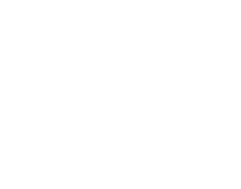
**Opinion Poll**



**Quality**

**Enhancement**

**Cell (QEC)**

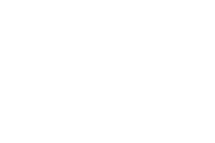


**Corporate**

**Relations/**

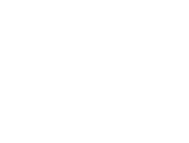
**Industrial**

**Liaison**



**Faculty**

**Opinion Poll**



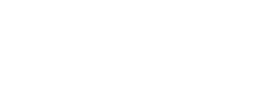
**Board of**

**Studies**

**(**

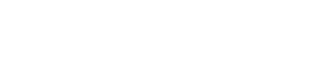
**BoS**

**)**



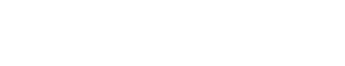
**Board of**

**Faculty (BoF)**

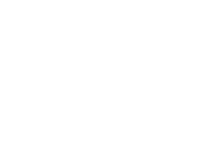


**Academic Council**

**Meeting (ACM)**



**END TERM REVIEW**



**External**

**SDP Review**



**Curriculum Advisory**

**Board**

**(**

**CAB**

**)**

Figure QEC Hierarchy and the CQI Process

**Objective:**

To make KIET the Center of Excellence by consistently ensuring curriculum in each semester, is better than the previous one.

**Schedule of Meeting:**

The Board meets once in every semester.

**Areas of Concern:**

The Board besides reviewing the academic performance formulates policies and takes decisions related to following areas

1. Program and curriculum structure development and review
   1. Development of new programs and specializations
   2. Introduction of new courses and syllabi
   3. Review of curricula
   4. Pre-requisite structure and substitutes
2. Development of quality control procedures and policies
   1. Ensure that all programs maintain the same quality levels
   2. Formal policy issuance and development of compliance frameworks
3. Development of academic procedures and policies
   1. Exemptions, Examination & Grading policy
   2. Course breakdown structure and policy
   3. Faculty review, Final projects, Internship and Absence policy
4. Faculty Related Procedures and Policies
   1. Selection policy and procedures: Recommend scales, Terms and conditions and Promotion criteria, Supervision of faculty hiring process
   2. Course allocation, Course load, policy for full-time and adjunct faculty
   3. Faculty development initiatives and Incentives system
   4. Faculty productivity requirements and Counseling system
5. Academic progress evaluation and review frameworks
   1. Course monitoring system, Reporting frameworks and Outlines review
   2. Examination review policy and Course execution monitoring system
   3. Analysis of results and trends and Recommend corrective actions
   4. Monitoring and control of the policy executions

## Engineering Curriculum Advisory Board (CAB)

The Engineering Curriculum Advisory Board (CAB) exists to remain abreast with the requirements of local industry. The aim of Engineering Curriculum Advisory Board is to take industry input in the process of curriculum development. Its functions are equivalent to that of Industrial Advisory Board in the OBE system. The Board acts as a bridge between industry and academia. Engineering Curriculum Advisory Board consists of:

* Dean Academics – Chairman
* Director College (s)
* HODs
* Distinguished Professors from Academia
* Eminent Professionals from industry

**Composition of Engineering Curriculum Advisory Board**

The following members approved the syllabus for the program in consideration:

|  |  |  |
| --- | --- | --- |
| Dr. Ali Raza Jafri | Professor & Chairman  Biomedical Engg Department,  NED University LEJ Campus | Academia |
| Dr. Muhammad Mohsin Aman | NEDUET | Academia |
| Mr. Fawad Qureshi | Industry Consultant | Industry |
| Mr. Humayun Qureshi | Industry Consultant | Industry |
| Mr. Javed Gul | School of Aeronautics, PAF | Academia |
| Mr. Harris | School of Aeronautics, PAF | Academia |
| Prof. Dr. Muzzaffar Mahmood | Dean Academics, KIET | Academia |
| Prof. Dr. Imran Naseem | Head of Curriculum, KIET | Academia |
| Prof. Dr. M. Bilal Kadri | HoD Mechatronics | Academia |
| Prof. Dr. Arsalan Jawaid | HoD Mechatronics | Academia |
| Assoc. Prof. Dr. Sameer Hashmat | HoD Electrical | Academia |
| Astt. Prof. Najeeb Jaffri | KIET | Academia |
| Astt. Prof. Muhammad Ejaz Tayyab | Secretary ECAC, KIET | Academia |

## Board of Advance Studies and Research:

The Board of Advance Studies and Research (BASR) addresses all matters related to promotion of advanced studies, research and publications at the Institute. The functions of BASR are:

1. Advice on all matters connected with promotion of advanced studies, research and publications in at the institute.
2. Consider and report to the authorities on the institution of research degrees at the institute.
3. Propose Regulations regarding the award of research degrees.
4. Appoint supervisors, for postgraduate research students, and to approve titles and synopsis of thesis/dissertations.
5. Recommend panels of examiners for evaluation of thesis and other research examinations.
6. Perform such other functions as may be prescribed by statutes.

The Board of Advance Studies and Research consists of:

|  |  |  |
| --- | --- | --- |
| 1 | AVM (Retd.) Tubrez Asif | President KIET – Chairman |
| 2 | Prof.Dr. Muzzaffar Mahmood | Dean Academics KIET- Member |
| 3 | Prof. Dr. Muhammad Amin | Director College of Humanities & Sciences |
| 4 | Mr Najeeb Haider Jafri | Director College of Engineering-Member |
| 5 | Mr Khalid Khan | Director CoC & IS-Member |
| 6 | Mr Adnan Anwar | Director College of Management Sciences-Member |
| 7 | Dr Imran Naseem | GSSE College Coordinators (Engg) |
| 8 | Dr Khurram Nazir Junejo | GSSE College Coordinators (CS) |
| 9 | External | Expert |
| 10 | Farman Raza | Secretary Board |

## Academic Council:

The Academic Council functions in accordance with the provisions of the Karachi Institute of Economics & Technology Ordinance 2000. The list below shows the members of the Academic Council:

|  |  |
| --- | --- |
| AVM (R) Tubrez Asif *President KIET* | Chairman |
| Prof. Dr. Muzzaffar Mahmood *Dean Academics* | Member |
| Mr. Farman Raza  *Graduate School of Sciences & Engineering/D.QEC* | Member |
| Air Commodore (R) M Nizam Uddin  *Registrar* | Member |
| Assoc Prof Muhammad Khalid Khan  *Director College of Computing and Information Sciences* | Member |
| Mr. Syed Najeeb Haider Jafri  *Director College of Engineering* | Member |
| Mr. Adnan Anwar  *Director College of Management Sciences* | Member |
| Professor Afzal Kazmi  *A person of eminence in the field of education, nominated by Pakistan Education Foundation (PEF)* | Member |
| Professor Dr Pervez Siddiqui | Member |
| *A person of eminence in the field of education, nominated by Pakistan Education Foundation (PEF)* |  |
| Secretary Education *Government of Sindh* | Member |
| Director General  *Regional Office HEC* | Member |
| Ms. Shagufta Rafif  *Member PEF* | Member |
| Prof. Dr. Iqbal Panwar  *Member PEF* | Member |
| Base Commander  *PAF Base, Korangi Creek* | Member |
| OC Training Wing  *PAF Base, Korangi Creek* | Member |

# Criterion 1 - Program Educational Objectives

## Vision and Mission of PAF- Karachi Institute of Economics and Technology

**Vision Statement - KIET**

“To be amongst the leading Universities of the world where an excellent environment for education, research and innovation exists, to produce quality leaders and entrepreneurs”.

**Mission Statement - KIET**

"KIET is committed in providing a quality learning and research environment in order to inculcate fundamental and specialized knowledge and skill for producing competent professionals with focus on technology, innovation and entrepreneurship”.

**Vision Statement - Department of Mechatronics Engineering**

“We envision to be a center of excellence in Mechatronics engineering where highest quality education produces ethical and visionary professionals at national and global levels with a focus on research and entrepreneurship”.

**Mission Statement - Department of Mechatronics Engineering**

“To educate students through highly qualified faculty to have strong theoretical and practical expertise, team-work, leadership qualities, ethical values and entrepreneurship skills. Establish and maintain state-of-the-art laboratories, latest curriculum and industrial linkages. Prepare graduates to pursue higher studies and undertake research at national and global levels”.

## Program Educational Objectives (PEO’s)

The broad objectives of the undergraduate program in Mechatronics Engineering are to instill in its graduates a solid foundation of mathematical, scientific and engineering knowledge in addition to developing the intellectual skills essential for prosperity and success in their careers. The PEOs of Mechatronics Engineering Program are given below. These PEOs will be evaluated and reviewed after 5 years of the graduation of each annual intake as per PEC criteria.

1. The graduates will apply their engineering knowledge to solve complex engineering problems. Carry out research, design, analyze and experimentally validate the systems and conclude valid results.
2. The graduates will be able to meet industry expectations, equipped with the usage of modern tools, have good communication skills, and be able to work as team members while demonstrating project management skills. Should have a commitment to life-long continual learning and to promote entrepreneurship ventures.
3. The graduates will be effective engineers with high morals & professional ethics as well as awareness of the societal impact of Mechatronics Engineering with reference to environment.

These PEOs are published on department website at [http://coe.pafkiet.edu.pk/outcomebased\_education/](http://coe.pafkiet.edu.pk/outcome-based_education/)  as well as displayed at various places in the department.

Mapping of PEO’s with Vision and Mission of the Institution and consistency of PEO’s with vision and mission of Institution is demonstrated in the following table.

**Table 2 Mapping of PEOs with Vision and Mission Statement of KIET**

|  |  |  |  |
| --- | --- | --- | --- |
| **S#** | **Program Educational Objectives** | **Vision Statement** | **Mission Statement** |
| 1 | The graduates will apply their engineering knowledge to solve complex engineering problems. Carry out research, design, analyze and experimentally validate the systems and conclude valid results. |  |  |
| 2 | The graduates will be able to meet industry expectations, equipped with the usage of modern tools, have good communication skills, and be able to work as team members while demonstrating project management skills. Should have a commitment to life-long continual learning and to promote entrepreneurship ventures. |  |  |
| 3 | The graduates will be effective engineers with high morals & professional ethics as well as awareness of the societal impact of Mechatronics Engineering with reference to environment. |  |  |

## Formulation/Review of PEOs

The program educational objectives were formulated by the department in consultation with the stakeholders. The proposed PEOs were placed in Engineering Curriculum Advisory Board and Board of Studies (BoS) of Mechatronics Engineering Department for their recommendations. The recommended PEOs from BoS were placed before the Academic Council for further review and approval. Consequently, Academic Council approved the PEOs of the Department. Feedback of PEOs attainment from the stakeholders will be taken annually, whereas, review of PEOs will be done after 5 years of the graduation of each batch.

## Process to Evaluate Attainment of PEO’s

Mapping of KIET’s Mission and Vision with PEOs demonstrates that the PEOs of the Mechatronics Engineering Program emanate from the vision and mission of the University. The Mechatronics Engineering Department and its faculty are continuously in touch with the industry and alumni to access the evolving requirements of the stakeholders. A formal process of conducting alumni and employer surveys on yearly basis has been adapted to measure the attainment of the PEOs of graduates. The review of this attainment data will be done after five years of the graduation of each batch. The Alumni and Employer’s survey forms are provided in the **Annexures-B1** and **B3**. These Survey forms have dedicated section of questions asking feedback from the stakeholders about the relevance of the mission and vision of KIET and PEOs of Mechatronics Engineering Department with their requirements and needs. Key Performance Indicators (KPIs) have been defined regarding the achievement of each PEO. These are indicated against each PEO in Table 3.

Table 3. Assessment Tools and KPI for PEO attainment

|  |  |  |
| --- | --- | --- |
| **PEO** | **Assessment Tool** | **KPI for PEO Attainment** |
| PEO-1  The graduates will apply their engineering knowledge to solve complex engineering problems. Carry out research, design, analyze and experimentally validate the systems and conclude valid results. | Alumni Survey 1  Employer Survey 1 | Number of graduates who rated 2 and above should be ≥50%  Number of Employers who rated 2 and above should be ≥50% |
| PEO-2  The graduates will be able to meet industry expectations, equipped with the usage of modern tools, have good communication skills, and be able to work as a team member while demonstrating project management skills. Should have a commitment to life-long continual learning and to promote entrepreneurship ventures. | Alumni Survey 2-3  Employer Survey 2-3 | Number of graduates who rated 2 and above should be ≥50%  Number of Employers who rated 2 and above should be ≥50% |
| PEO-3  The graduates will be effective engineers with high morals & professional ethics as well as awareness of the societal impact of Mechatronics Engineering with reference to environment. | Alumni Survey 4  Employer Survey 4 | Number of graduates who rated 2 and above should be ≥50%  Number of Employers who rated 2 and above should be ≥50% |

The results of the survey will be compiled, reviewed and possible corrective actions will be implemented in case if one or more of the KPIs are not met by the graduates.

## CQI on PEO Attainment

The assessment of PEOs is done through Alumni and Employer surveys. These surveys will be conducted annually, whereas, the analysis and review of the PEOs will be conducted after 5 years of the graduation of each batch. The corrective actions will be suggested and implemented if one or more KPIs of PEOs are not met. The flow chart of the processes involved in the assessment and achievement of PEOs is shown in Figure 3.

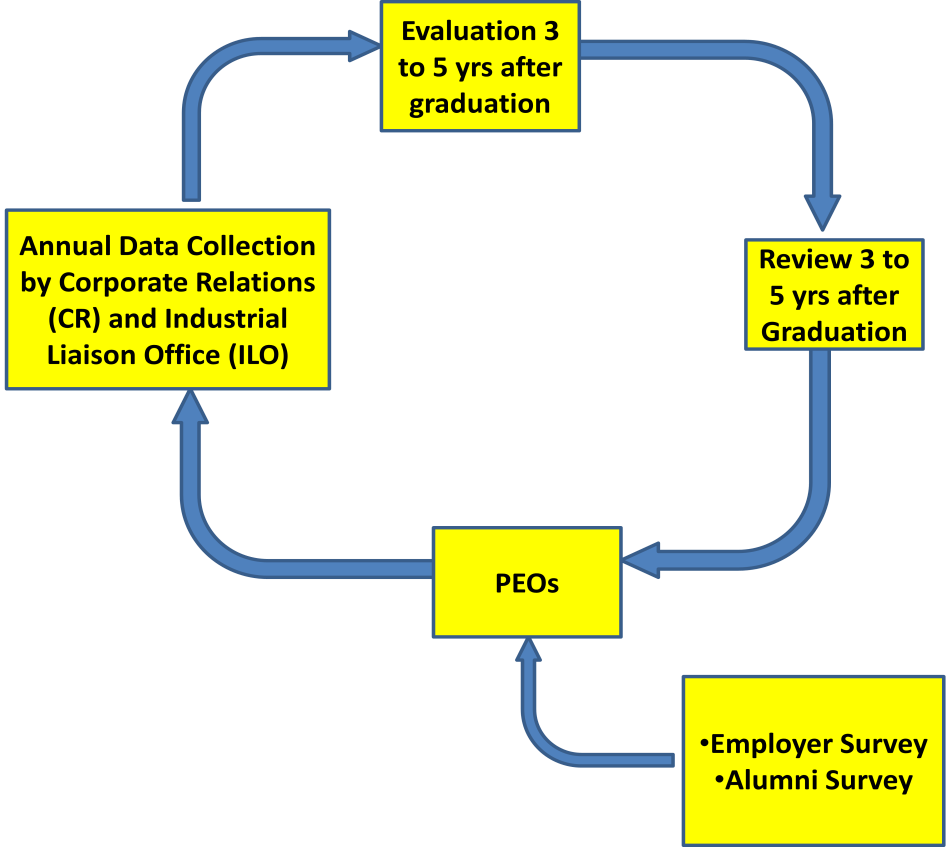


Figure Flow Chart of the CQI process for PEO attainment

The implementation of corrective actions are shown in the figure below



Figure Implementation of Corrective Actions



KIET has a very rich source of alumni working in diverse industries which will be an accurate source for the evaluation of the PEOs. Some of which are:

List of Organizations where Mechatronics Department Alumni are working

|  |  |
| --- | --- |
| Transsion tecno electronics | Dalda cooking oil, |
| Yunus Textile mills Ltd | Fauji akbar portia |
| Sahil semiconductors | Habibullah Industries and Associates |
| Millat Industries Pvt limited | Alsons Group of Industries pvt Limited |
| Artistic Milliners Pvt Limited | Riz Electric(Home automation & Solar company) |
| Faisal Movers | ADM (Artistic Denim Mills) |
| Fauji Akbar Portia Marine Terminal | Karachi Shipyard & Engineeringworks |
| Abtach Ltd. | Zero carbon Pvt. Ltd |
| Artistic Denim Mills | Globex Solution |
| Orient Water Technologies | Transsion Tecno Electronics Pvt. Ltd. |
| Gul Ahmed Textile Mills Ltd | Al Murtaza Machinery Company Ltd |
| Jubilee corporation | PAF unit 118 |

# Criterion 2 - Program Learning Outcomes

## Program Learning Outcomes

The Mechatronics Engineering Department has adopted 12 Graduate Attributes, as outlined in the OBA manual of Pakistan Engineering Council (PEC), as 12 Program Learning Outcomes (PLOs). These PLOs are approved by the Academic Council of University. The PLOs are listed below:

[PLO1] Engineering Knowledge: An ability to apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

[PLO2] Problem Analysis: An ability to identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

[PLO3] Design/Development of Solutions: An ability to design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

[PLO4] Investigation: An ability to investigate complex engineering problems in a methodical way including literature survey, design and conduct of experiments, analysis and interpretation of experimental data, and synthesis of information to derive valid conclusions.

[PLO5] Modern Tool Usage: An ability to create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, to complex engineering activities, with an understanding of the limitations.

[PLO6] The Engineer and Society: An ability to apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solution to complex engineering problems.

[PLO7] Environment and Sustainability: An ability to understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.

[PLO8] Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

[PLO9] Individual and Team Work: An ability to work effectively, as an individual or in a team, on multifaceted and /or multidisciplinary settings.

[PLO10] Communication: An ability to communicate effectively, orally as well as in writing, on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

[PLO11] Project Management: An ability to demonstrate management skills and apply engineering principles to one’s own work, as a member and/or leader in a team, to manage projects in a multidisciplinary environment.

[PLO12 ] Lifelong Learning: An ability to recognize the need for, and have the preparation and ability to engage in, independent and life-long learning in the broadest context of technological change.

## Encompassment of Graduate Attributes in PLOs

As mentioned in section 2.1, the Departmental PLOs strictly follow the graduate attributes as defined in the PEC OBA manual. Therefore, the graduates acquire engineering knowledge, soft skills and behavioral traits as required by the PEC. Table 4 below shows the 12 PLOs that follow the graduate attributes defined in OBA manual.

###### Table 4. PLO to PEO mapping

|  |  |  |  |
| --- | --- | --- | --- |
| **PLO/PEO** | **PEO-1** | **PEO-2** | **PEO-3** |
| PLO-1 |  |  |  |
| PLO-2 |  |  |  |
| PLO-3 |  |  |  |
| PLO-4 |  |  |  |
| PLO-5 |  |  |  |
| PLO-6 |  |  |  |
| PLO-7 |  |  |  |
| PLO-8 |  |  |  |
| PLO-9 |  |  |  |
| PLO-10 |  |  |  |
| PLO-11 |  |  |  |
| PLO-12 |  |  |  |

## Mapping of Courses to PLOs

Each course defines its course learning outcomes (CLOs) which are mapped to the corresponding PLOs with different emphasis levels. The matrix below shows the mapping of the PLOs with all the courses of Mechatronics Engineering degree offered at Department of Mechatronics Engineering.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Semester No.** | **Course Code** | **Course Title** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
|  |  |  |  |  |  |  |  |  |  |  |  |
| 1 | EE1401 | Linear Circuit Analysis | 2 | 3 |  |  |  |  |  |  |  |  |  |  |
| EE1401 | Linear Circuit Analysis Lab | 1 | 2 | 2 | 3 | 1 |  |  | 1 | 1 |  |  |  |
| MS1401 | Engineering Physics | 2 | 3 |  |  |  |  |  |  |  |  |  |  |
| MS1401 | Engineering Physics Lab | 1 | 2 | 1 |  |  |  |  | 1 | 1 |  |  |  |
| CS1301 | Introduction to Computer Programming | 3 |  |  |  |  |  |  |  |  |  |  | 1 |
| CS1301 | Introduction to Computer Programming Lab | 1 | 1 | 3 |  | 2 |  |  | 1 | 1 |  |  |  |
| MS1302 | Calculus | 1 | 1 | 1 |  |  |  |  |  |  |  |  |  |
| ME1102 | Workshop Technology | 1 |  | 1 |  | 3 |  |  | 2 | 1 |  |  |  |
| HS1102 | Community Service |  |  |  |  |  | 2 | 2 |  | 3 |  |  |  |
| 2 | MS1303 | Linear Algebra | 1 | 1 | 1 |  |  |  |  |  |  |  |  |  |
| EE2403 | Fundamentals of Electronics | 2 | 2 | 1 |  |  |  |  |  |  |  |  |  |
| EE2403 | Fundamentals of Electronics Lab | 1 | 1 | 1 | 3 | 2 |  |  | 1 | 1 |  |  |  |
| HS1101 | Leadership and Motivation |  | 2 |  |  |  |  |  |  | 3 |  |  | 1 |
| EE1407 | Digital Logic Fundamentals | 2 | 2 |  |  |  |  |  |  |  |  |  |  |
| EE1407 | Digital Logic Fundamentals Lab | 1 | 1 | 3 | 3 | 1 |  |  | 1 | 1 |  |  |  |
| ME1204 | Engineering Statics | 2 | 3 |  |  |  |  |  |  |  |  |  |  |
| ME2201 | Engineering Drawing | 2 |  |  |  | 3 |  |  |  |  |  |  |  |
| 3 | ME2205 | Engineering Dynamics | 2 | 3 |  |  |  |  |  |  |  |  |  |  |
| MS1304 | Differential Equations and Transforms | 1 | 1 | 1 |  |  |  |  |  |  |  |  |  |
| EE2302 | Electrical Network Analysis | 2 | 3 |  |  |  |  |  |  |  |  |  |  |
| EE2404 | Electronic Circuit Design | 3 | 3 | 1 |  |  |  |  |  |  |  |  |  |
| EE2404 | Electronic Circuit Design Lab | 1 |  | 3 | 2 | 2 |  |  | 1 | 1 |  |  |  |
| HS2304 | English (Public Speaking) |  |  |  |  |  | 1 |  |  |  | 3 |  | 3 |
| ME2309 | Mechanics of Materials | 2 | 3 |  |  |  |  |  |  |  |  |  |  |
| 4 | MS2305 | Complex Variables and Multivariable Calculus | 1 | 1 | 1 |  |  |  |  |  |  |  |  |  |
| EE2209 | Signals and Systems | 3 | 2 |  |  |  |  |  |  |  |  |  |  |
| EE3405 | Linear ICs and Applications | 2 |  | 3 |  |  |  |  |  |  |  |  |  |
| EE3405 | Linear ICs and Applications Lab | 1 | 2 | 3 | 1 | 2 |  |  | 1 | 1 |  |  |  |
| ME3408 | Fluid Mechanics | 2 | 3 |  |  |  |  |  |  |  |  |  |  |
| ME3408 | Fluid Mechanics Lab | 1 |  | 2 | 3 |  |  |  | 1 | 1 |  |  |  |
| EE2425 | Electrical Machines | 2 | 3 |  |  |  |  |  |  |  |  |  |  |
| EE2425 | Electrical Machines Lab | 1 | 1 | 2 | 1 | 3 |  |  | 3 | 1 |  |  |  |
| 5 | EE3417 | Microcontroller based Systems | 3 |  | 2 |  |  |  |  |  |  |  |  |  |
| EE3417 | Microcontroller based Systems Lab | 1 | 1 | 3 | 1 | 2 |  |  | 1 |  |  |  |  |
| EE3411 | Linear Control Systems | 2 | 3 | 1 |  |  |  |  |  |  |  |  |  |
| EE3411 | Linear Control Systems Lab | 2 | 1 | 2 | 2 | 3 |  |  | 1 | 1 |  |  |  |
| ME3326 | Theory of Machines |  | 3 |  |  |  |  |  |  |  |  |  |  |
| EE3306 | Instrumentation and Measurement | 3 | 3 |  |  |  |  |  |  |  |  |  |  |
| EE3306 | Instrumentation and Measurement Lab | 2 | 1 | 2 | 1 | 2 |  |  | 1 | 1 |  |  |  |
| ME3307 | Fundamentals of Thermal Sciences | 1 | 1 | 2 |  |  |  |  |  |  |  |  |  |
| ME3307 | Fundamentals of Thermal Sciences Lab | 1 |  | 2 | 3 |  |  |  | 1 | 1 |  |  |  |
| 6 | HS4206 | Professional and Social Ethics |  |  |  |  |  | 1 |  | 3 |  | 2 |  |  |
| ME2310 | Materials and Manufacturing Processes | 1 | 1 |  |  |  |  |  |  |  |  |  |  |
| ME3212 | Machine Design |  | 1 | 1 | 1 |  |  |  |  |  |  |  |  |
| EE3327 | Power Electronics |  | 1 | 1 | 1 |  |  |  |  |  |  |  |  |
| EE3327 | Power Electronics Lab | 1 | 1 | 1 | 2 |  |  |  | 1 | 1 |  |  |  |
| MG3301 | Project Management | 1 |  |  |  | 1 |  |  |  |  |  | 3 |  |
| MS3306 | Probability Methods in Engineering | 1 | 1 | 1 |  |  |  |  |  |  |  |  |  |
| 7 | MTE4314 | Mechatronic System design |  | 2 | 2 |  |  |  |  |  |  |  |  | 1 |
| ME4314 | Mechatronic System design Lab | 1 | 1 | 2 | 3 | 1 |  |  | 1 | 1 |  |  |  |
| ME4320 | Introduction to Robotics |  | 1 |  | 3 |  |  |  |  |  |  |  |  |
| ME4320 | Introduction to Robotics Lab | 1 | 1 | 1 | 2 | 1 |  |  | 1 | 1 |  |  |  |
| EE4321 | Industrial Control and Automation |  | 2 | 1 | 1 |  |  |  |  |  |  |  |  |
| EE4321 | Industrial Control and Automation Lab | 1 | 2 | 3 |  | 2 |  |  | 1 | 1 |  |  |  |
| MTE4313 | Sensors and Actuators |  | 3 | 1 |  |  |  |  |  |  |  |  |  |
| ME4313 | Sensors and Actuators Lab | 1 | 1 | 1 | 2 | 1 |  |  | 1 | 1 |  |  |  |
| DP4301 | SDP-I | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 8 | MG4302 | Technology Entrepreneurship |  |  | 1 |  | 1 |  |  |  |  |  |  | 1 |
| HS3305 | English (Official  Communication and Report  Writing) |  |  |  |  |  |  |  |  |  | 3 |  |  |
| HS3306 | Pakistan and Islamic Studies |  | 1 |  |  |  |  |  | 1 |  |  |  |  |
| MS4307 | Numerical Methods | 1 | 1 | 1 |  |  |  |  |  |  |  |  |  |
| MTE4323 | Mobile Robotics | 1 | 1 | 1 |  |  |  |  |  |  |  |  |  |
| DP4302 | SDP-II | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

The mapping of the PLOs along with the emphasis level is done by the Teaching Interest Groups and reviewed by the Teaching Interest Groups Heads. The final recommendation of the mapping of PLOs is given by BoS, which is reviewed and approved by CAB and BoF.

## Teaching-Learning and Assessment Methods for Attainment of PLOs

The attainment of PLOs primarily depends on the attainment of CLOs. Each theory and Lab course defines 2 to 5 CLOs, where each CLO is mapped to the corresponding PLO(s). The instructor takes quizzes, assignments, mid semester exam, end semester exam etc. which cover the entire CLOs of the course. The attainment of PLO of a particular student is assessed from the weighted score achieved in these PLOs. Details of PLO intensity (emphasis) levels are given in **Annexure-D**. All the students who achieve 40% or more in a PLO are considered to achieve the respective PLO. The students having less than 40% in a PLO are considered as fail in the respective PLO. The attainment of a particular PLO of each student in current semester is measured at the end of every semester. The measurement is made taking in to account the PLO attainment and the emphasis level of the PLO in each course. Similarly the overall attainment of a particular PLO of each student till current semester is made. Sample reports of PLO attainment are given in **Annexure-M**. For individual student, if a particular PLO is not met then the student is advised through class advisor to focus on the corresponding PLO if it is available in the courses of upcoming semesters. Otherwise, the student is given extra tutorials and special assignments for the achievement of failed PLOs.

## Assessment Processes to Evaluate Attainment of PLOs

The assessment of PLOs is done both directly through CLOs (Exams, semester projects, Labs, Final year project (Rubrics)) and indirectly through Internship Feedback and Graduating Student Exit survey, attached as **Annexures-B2** and **B4**. The evaluation of the PLO attainment is based on these measurements. **Table 5** shows the methods of PLO assessment, when the PLO attainment is measured and the KPIs for evaluating the attainment of PLOs.

###### Table 5. Key Performance Indicators and PLO Attainment Measures

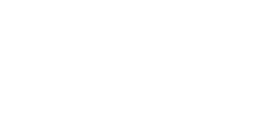
|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PLOs** | **Assessment Level** | **Method** | **When Measured** | **KPIs** | **Measurement Tools** |
| PLOs  (1-12) | Student | Direct | At end of every semester | Each Student should attain at least 40% score in each  individual PLO | PLOs Assessment Sheet of each  course |
| At Graduation | Each Student should attain at least 40% score in each of 12  PLOs | PLOs Assessment  Sheet of all courses and SDP rubrics |
| Cohort | Direct | At Graduation | At least 50% of all graduating students should attain 40% in all PLOs | PLOs Assessment  Sheet of all courses and SDP rubrics |
| Indirect | At Graduation | Number of students attaining 2 and above on scale of 1-5 ≥ 50% | Graduating Student Survey |
| Indirect | Annual | Number of students attaining 2 and above on scale of 1-5 ≥ 50% | Internship Feedback |

## CQI Process for PLOs and Involvement of Various Stakeholders

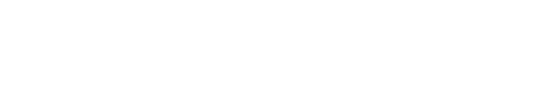
The Department will be responsible for the assessment, analysis, review and possible improvements in the attainment of all PLOs. Figure below shows the flow chart of the processes involved in the assessment and achievement of PLOs.

**Evaluation of program every 04 years and courses every semester**

Evaluation of program every 04 years and courses every semestercc

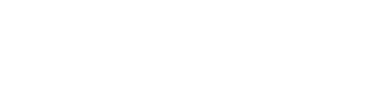


**PLOs**



**Review Panel under Teaching Interest**

**Groups Heads**



**Data Collection every**

**semester**

**Indirect Assessment**

•

**Graduating**

**Students Survey**

•

**Internship**

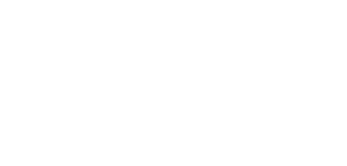
**Survey**



**BoS, BoF, CAB and ACM**



**Faculty**



**Review**

**Process**

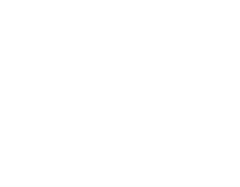


Figure Flow-chart of the processes involved in the assessment and achievement of PLOs

As mentioned above, the assessment of PLOs is done both directly through CLOs (Exams, semester projects, Labs, Final year project (Rubrics)) and indirectly through Internship Feedback and Graduating Student Exit survey. The data is gathered at the end of every semester and the Teaching Interest Groups do the analysis of the data both at the student/course level after every semester and at Program level after 4 years. The analysis report will be presented to the BoS, CAB and BoF for review and suggestions for possible corrective actions if one or more of the KPIs are not met by the students at individual and cohort level. The final approval of the corrective actions is sent to Academic Council if they require change to PEOs. The Process for Review and Implementation of Corrective Actions for PLOs is shown in Figure below.



**Measurement of PLOs**

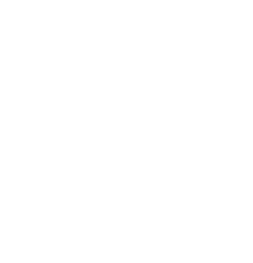


**Failed PLO**

**repeated in**

**subsequent**

**semesters**

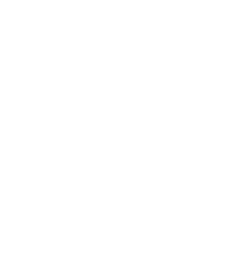


**Failed PLO NOT**

**repeated in**

**subsequent**

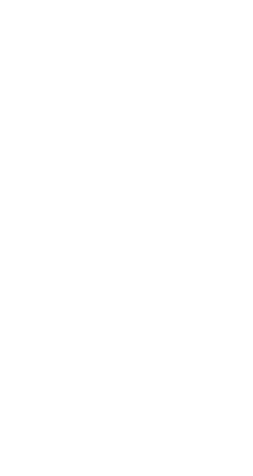
**semesters**



**Class Advisor**

**Counselling**

**sessions**



**Class Advisor**

**devises**

**corrective**

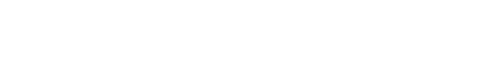
**strategies**

**repeating**

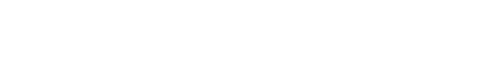
**course(s)**



**Individual PLO Assessment**



**Cohort PLO Assessment**



**Review of KPIs**



**Review**

**Assessment Methodology**



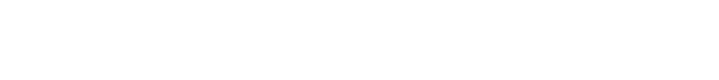
**Review CLOs to PLOs mapping**



**Review by Teaching Interest Groups**



**Revision of Course Content**



**Approval by BoS, BoF, CAB and ACM**

Figure Review process and corrective action implementation for PLO attainment

The stakeholders such as Faculty, Alumni, Employers and students are involved in the CQI process in a number of ways

1. Student feedback is taken at the end of every semester for improving the quality of teaching and assessment methods.
2. Graduating student feedback is taken for reviewing the achievement of the program learning outcomes.
3. Internship Feedback is taken from the Industry through Internship Feedback Form to assess the performance of the students during internship.
4. The Instructor course feedback is taken at the end of every semester, which is reviewed by the department for possible improvements in the learning outcomes.
5. The Employers and Industry professionals are invited to the Open House and Job Fair, arranged each year by University, as Judges and Guests. They take interviews of the students or can take the CV of the students and call them for interview later. The Judges also give feedback for improving the quality of the work of students.
6. The Department also arranges CEO Talk Sessions with the ambition to motivate and inspire students for the implementation of their innovative ideas and to drive them towards entrepreneurship.
7. "The College of Engineering, KIET plans Alumni Reunion each year. Besides the opportunity of meeting the alumni once again, the College also intends to acknowledge Alumni's performance in the industry. For this purpose BEST ACHIEVER AWARDS and BEST ENTREPRENUER are given to outstanding professionals. This is done through a self-nomination process. The Alumni Reunion also plans to give opportunity to alumni to express their corporate experiences through formal speeches. The reunion event ends with sharing memories and photos of alumni."

# Criterion 3 - Curriculum and Learning Process

## Program Structure and Curriculum Coverage

The curriculum for the undergraduate program in Mechatronics Engineering degree is based on the PEC/HEC prescribed Curriculum Design as shown in **Annexure-E**.

## Coverage at Engineering and Non-Engineering Courses

The Department of Mechatronics Engineering follows the PEC/HEC guidelines for the coverage of BE courses at Engineering and Non-Engineering domains. The current ratio of Engineering and Non-Engineering courses is present in Annex-E which is in-line with PEC/HEC guidelines.

**Non-Engineering Courses**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Knowledge Area** | **Subject Area** | **Course** | **Theory Contact Hours** | **Practical Contact Hours** | **Credit Hours** | **Number of Courses** | **Total Credit Hours** |
| **Humanities** |  | English  (Public Speaking) | 2 | 0 | 2 |  |  |
|  | English | English ( Official Communication and Report Writing) | 3 | 0 | 3 | 2 | 5 |
|  | Culture | Islam and Pakistan Studies | 3 | 0 | 3 | 1 | 3 |
|  | Social Sciences | Professional and Social Ethics | 2 | 0 | 2 | 3 | 4 |
|  |  | Leadership and Motivation | 1 | 0 | 1 |  |  |
|  |  | Community Service | 0 | 3 | 1 |  |  |
| **Management Sciences** |  | Engineering Project Management | 3 | 0 | 3 | 2 | 6 |
|  |  | Technology Entrepreneurship | 3 | 0 | 3 |  |  |
| **Natural Sciences** | Math | Calculus | 3 | 0 | 3 | 6 | 18 |
|  |  | Linear Algebra | 3 | 0 | 3 |  |  |
|  |  | Differential Equations and Transforms | 3 | 0 | 3 |  |  |
|  |  | Complex Variables and Multivariable Calculus | 3 | 0 | 3 |  |  |
|  |  | Numerical Methods | 3 | 0 | 3 |  |  |
|  |  | Probability Methods in Engineering | 3 | 0 | 3 |  |
|  | Physics | Engineering Physics | 3 | 3 | 4 | 1 | 4 |
| **Subtotal (Non-Engineering)** | | | **38** | **6** | **40** | **15** | **40** |

**Engineering Courses:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Knowledge Area | Course | Theory Contact Hours | Practical Contact Hours | Credit Hours | Number of Courses | Total Credit Hours |
| Computing | Introduction to Computer Programming | 2 | 3 | 3 | 2 | 7 |
|  | Digital Logic Fundamentals | 3 | 3 | 4 |  |  |
| Foundation | Engineering Drawing | 0 | 6 | 2 | 11 | 34 |
|  | Workshop Technology | 0 | 6 | 2 |  |  |
|  | Engineering Statics | 3 | 0 | 3 |  |  |
|  | Engineering Dynamics | 3 | 0 | 3 |  |  |
|  | Linear Circuit Analysis | 3 | 3 | 4 |  |  |
|  | Electrical Machines | 3 | 3 | 4 |  |  |
|  | Fundamentals of Electronics | 3 | 3 | 4 |  |  |
|  | Fluid Mechanics | 3 | 3 | 4 |  |  |
|  | Mechanics of Materials | 3 | 0 | 3 |  |  |
|  | Material and Manufacturing Processes | 3 | 0 | 3 |  |  |
|  | Signals and Systems | 2 | 0 | 2 |  |  |
| Breadth | Fundamentals of Thermal Sciences | 3 | 3 | 4 | 8 | 29 |
|  | Theory of Machines | 3 | 0 | 3 |  |  |
|  | Electrical Network Analysis | 3 | 0 | 3 |  |  |
|  | Electronic Circuit Design | 3 | 3 | 4 |  |  |
|  | Linear Integrated Circuits and Applications | 3 | 3 | 4 |  |  |
|  | Microcontroller based systems | 3 | 3 | 4 |  |  |
|  | Instrumentation &Measurement | 2 | 3 | 3 |  |  |
|  | Linear Control Systems | 3 | 3 | 4 |  |  |
| Depth | Sensors and Actuators (Elec 1) | 3 | 3 | 4 | 7 | 24 |
|  | Robotics | 3 | 3 | 4 |  |  |
|  | Mobile Robotics (Elec 3) | 3 | 0 | 3 |  |  |
|  | Power Electronics (Elec 2) | 3 | 3 | 4 |  |  |
|  | Machine Design | 3 | 0 | 3 |  |  |
|  | Mechatronic System Design | 2 | 3 | 3 |  |  |
|  | Industrial Control and Automation | 2 | 3 | 3 |  |  |
| Senior Design Project | Senior Design Project - I | 0 | 9 | 3 | 2 | 6 |
| Senior Design Project - II | 0 | 9 | 3 |  |  |
|  | Industrial Training (Summer) | 0 | 0 | 0 | 0 | 0 |
| **Subtotal (Engineering)** | | | | | **30** | **100** |

**Comparison Matrix with HEC (SP19, SP20, SP21)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Domain | Knowledge Area | Subject Area | **HEC/PEC** | | **KIET** | |
| **Courses** | **Cr Hrs** | **Courses** | **Cr Hrs** |
| Engineering | Engineering  Foundation | Engineering Drawing  Workshop Technology  Engineering Statics  Engineering Dynamics  Linear Circuit Analysis  Electrical Machines  Fundamentals of Electronics  Fluid Mechanics  Mechanics of Materials  Material and Manufacturing Processes  Signals and Systems | 11 | 32 | 11 | 34 |
| Major Based Core (Breadth) | Fundamentals of Thermal Sciences  Theory of Machines  Electrical Network Analysis  Electronic Circuit Design  Linear Integrated Circuits and Applications  Microcontroller based systems  Instrumentation & Measurement  Linear Control Systems | 8 | 28 | 8 | 29 |
| Major Based Core (Depth) | Mechatronic Electives | 7 | 22 | 7 | 24 |
| Computer Sciences | Programming | 3 | 10 | 2 | 7 |
| Design |
| Final Year Project | Senior Design Project | 2 | 6 | 2 | 6 |
|  |  | **Sub Total** | **31** | **98** | **29** | **100** |
| Non-Engineering | Humanities | English, Culture,  Social Sciences | 6 | 12 | 6 | 12 |
| Management Sciences | Engineering Project Management  Technology Entrepreneurship | 2 | 6 | 2 | 6 |
| Natural Sciences | Mathematics  Electives  Engineering Physics | 7 | 21 | 7 | 22 |
|  | **Sub Total** | **15** | **39** | **15** | **40** |
|  | **Total** | **46** | **137** | **44** | **140** |
| Industrial Training (Summer Internships) | Internship I & II |  |  |  | 2 |
| Physical Trg& Education (Sports) | Sports |  |  |  | 4 |
|  |  | **Sub Total** |  |  |  | **6** |
| **Program Total** | | |  |  |  | **146** |

**Program Structure (SP 22 and onwards)**

**Non-Engineering Courses**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Knowledge Area** | **Subject Area** | **Course** | **Theory Contact Hours** | **Practical Contact Hours** | **Credit Hours** | **Number of Courses** | **Total Credit Hours** |
| **Humanities** |  | English  (Public Speaking) | 2 | 0 | 2 |  |  |
|  | English | English ( Official Communication and Report Writing) | 3 | 0 | 3 | 2 | 5 |
|  | Culture | Islam and Pakistan Studies | 3 | 0 | 3 | 1 | 3 |
|  | Social Sciences | Professional and Social Ethics | 2 | 0 | 2 | 3 | 4 |
|  |  | Leadership and Motivation | 1 | 0 | 1 |  |  |
|  |  | Community Service | 0 | 3 | 1 |  |  |
| **Management Sciences** |  | Engineering Project Management | 3 | 0 | 3 | 2 | 6 |
|  |  | Technology Entrepreneurship | 3 | 0 | 3 |  |  |
| **Natural Sciences** | Math | Calculus | 3 | 0 | 3 | 6 | 18 |
|  |  | Linear Algebra | 3 | 0 | 3 |  |  |
|  |  | Differential Equations and Transforms | 3 | 0 | 3 |  |  |
|  |  | Complex Variables and Multivariable Calculus | 3 | 0 | 3 |  |  |
|  |  | Numerical Methods | 3 | 0 | 3 |  |  |
|  |  | Probability Methods in Engineering | 3 | 0 | 3 |  |
|  | Physics | Engineering Physics | 3 | 3 | 4 | 1 | 4 |
| **Subtotal (Non-Engineering)** | | | **38** | **6** | **40** | **15** | **40** |

**Engineering Courses:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Knowledge Area | Course | Theory Contact Hours | Practical Contact Hours | Credit Hours | Number of Courses | Total Credit Hours |
| Computing | Introduction to Computer Programming | 2 | 3 | 3 | 3 | 11 |
|  | Digital Logic Fundamentals | 3 | 3 | 4 |  |  |
|  | Data Structure and Object Oriented Programming | 3 | 3 | 4 |  |  |
| Foundation | Workshop Technology | 0 | 6 | 2 | 11 | 33 |
|  | Engineering Drawing | 0 | 6 | 2 |  |  |
|  | Engineering Statics | 3 | 0 | 3 |  |  |
|  | Engineering Dynamics | 3 | 0 | 3 |  |  |
|  | Mechanics of Material | 3 | 0 | 3 |  |  |
|  | Material and Manufacturing Processes | 3 | 0 | 3 |  |  |
|  | Theory of Machines | 3 | 0 | 3 |  |  |
|  | Fluid Mechanics | 3 | 3 | 4 |  |  |
|  | Fundamentals of Electronics | 3 | 3 | 4 |  |  |
|  | Signals and Systems | 2 | 0 | 2 |  |  |
|  | Sensors and Actuators | 3 | 3 | 4 |  |  |
| Breadth | Fundamentals of Thermal Sciences | 3 | 3 | 4 | 8 | 27 |
|  | Linear Circuit Analysis | 3 | 3 | 4 |  |  |
|  | Electrical Network Analysis | 3 | 0 | 3 |  |  |
|  | Electronic Circuit Design | 3 | 3 | 4 |  |  |
|  | Solid Modeling | 0 | 3 | 1 |  |  |
|  | Microcontroller based systems | 3 | 3 | 4 |  |  |
|  | Instrumentation &Measurement | 2 | 3 | 3 |  |  |
|  | Linear Control Systems | 3 | 3 | 4 |  |  |
| Depth | Machine Design | 3 | 0 | 3 | 7 | 24 |
|  | Industrial Control and Automation | 2 | 3 | 3 |  |  |
|  | Mechatronic System Design | 2 | 3 | 3 |  |  |
|  | Robotics | 3 | 3 | 4 |  |  |
|  | Mobile Robotics (Elec 1) | 3 | 0 | 3 |  |  |
|  | Power Electronics (Elec 2) | 3 | 3 | 4 |  |  |
|  | Electrical Machines (Elec 3) | 3 | 3 | 4 |  |  |
| Senior Design Project | Senior Design Project - I | 0 | 9 | 3 | 2 | 6 |
| Senior Design Project - II | 0 | 9 | 3 |  |  |
|  | Industrial Training (Summer) | 0 | 0 | 0 | 0 | 0 |
| **Subtotal (Engineering)** | | | | | **31** | **101** |

**Comparison Matrix with HEC (SP22)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Domain | Knowledge Area | Subject Area | **HEC/PEC** | | **KIET** | |
| **Courses** | **Cr Hrs** | **Courses** | **Cr Hrs** |
| Engineering | Engineering  Foundation | Workshop Technology  Engineering Drawing  Engineering Statics  Engineering Dynamics  Mechanics of Material  Material and Manufacturing Processes  Theory of Machines  Fluid Mechanics  Fundamentals of Electronics  Signals and Systems  Sensors and Actuators | 11 | 32 | 11 | 33 |
| Major Based Core (Breadth) | Fundamentals of Thermal Sciences  Linear Circuit Analysis  Electrical Network Analysis  Electronic Circuit Design  Solid Modeling  Microcontroller based systems  Instrumentation &Measurement  Linear Control Systems | 8 | 28 | 8 | 27 |
| Major Based Core (Depth) | Machine Design  Industrial Control and Automation  Mechatronic System Design  Robotics  Mobile Robotics (Elec 1)  Power Electronics (Elec 2)  Electrical Machines (Elec 3) | 7 | 22 | 7 | 24 |
| Computer Sciences | Programming | 3 | 10 | 3 | 11 |
| Data Structure and OOP |
| Design |
| Final Year Project | Senior Design Project | 2 | 6 | 2 | 6 |
|  |  | **Sub Total** | **31** | **98** | **31** | **101** |
| Non-Engineering | Humanities | English, Culture,  Social Sciences | 6 | 12 | 6 | 12 |
| Management Sciences | Engineering Project Management  Technology Entrepreneurship | 2 | 6 | 2 | 6 |
| Natural Sciences | Mathematics  Electives  Engineering Physics | 7 | 21 | 7 | 22 |
|  | **Sub Total** | **15** | **39** | **15** | **40** |
|  | **Total** | **46** | **137** | **46** | **141** |
| Industrial Training (Summer Internships) | Internship I & II |  |  |  | 2 |
| Physical Trg& Education (Sports) | Sports |  |  |  | 4 |
|  |  | **Sub Total** |  |  |  | **6** |
| **Program Total** | | |  |  |  | **147** |

The details of the semester-wise BE course plan and knowledge areas of subjects are given in **Annexure-F**.

## Complex Engineering Problems and Activities

Complex Engineering problem requires in-depth knowledge of Engineering and have some or all of the characteristics mentioned below:

* Involve wide-ranging or conflicting technical, engineering and other issues where optimal tradeoffs are required.
* Have no obvious solution and require abstract thinking, originality in analysis to formulate suitable models.
* Requires research-based knowledge much of which is at, or informed by, the forefront of the professional discipline and which allows a fundamentals-based, first principles analytical approach.
* Involve infrequently encountered issues.
* Are outside problems encompassed by standards and codes of practice for professional engineering.
* Involve diverse groups of stakeholders with widely varying needs.
* Have significant consequences in a range of contexts.
* Are high level problems including many components parts or sub-problems

The students of Mechatronics Engineering Department are given CEPs in Senior Design Projects and mini design projects in all Lab courses.

## Laboratories

The Department has 05 dedicated and 06 shared laboratories whose names are mentioned below:

**Dedicated Labs**

1. Sensors & Actuators Lab
2. Senior Design Project Lab / Mechatronics System Design Lab
3. Fluid Mechanics Lab
4. Robotics Lab
5. General Engineering Workshop
6. Thermodynamics Lab

**Shared Labs**

1. Computation & Design Lab
2. Basic Electrical Engineering Lab
3. Microprocessors & Interfacing Lab
4. Digital System Lab
5. Electronics Lab
6. Industrial Automation Lab
7. Computation & Design Lab II
8. Basic Electrical Engineering Lab
9. Instrumentation and Data Acquisition Lab
10. Communication Lab
11. Power Electronics Lab

Details of the Labs equipment and Lab staff are given in **Annexures-G1 and G2**.

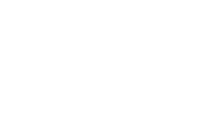
## Lab Work and Assessment Mechanism

The Labs are designed in such a way as to strengthen the practical concepts of the topics covered in the class and to achieve the learning outcomes defined for the course. The assessment of Labs is categorized into four components: Lab performance, Lab report, Lab Project and End Semester Demo/Oral Exam. Rubrics are defined for each component of the Lab which is used to measure the attainment of the CLOs/PLOs defined for the Lab. The samples of the Lab Rubrics is provided in **Annexure-G3**and Lab outlines for all courses are provided in **Annexure-G4.**

## Course Learning Outcomes and Bloom’s Taxonomy Levels

Course Learning Outcomes (CLOs) are defined for the theory and practical part of each course. These learning outcomes are clear and concise statements which are the objectives a student should achieve at the end of the course. The CLOs are defined by the course instructor and are reviewed and approved by the BoS. These CLOs are mapped to the corresponding PLOs and appropriate domains of Blooms taxonomy i.e. Cognitive, Affective and Psychomotor.

The CLOs of each student are assessed through quizzes, assignments, Mid-Semester Exam, End-Semester Exam, course projects, Lab work and Lab projects. The samples of course CLO files and assessment sheets are provided in Annex-. The KPI of 40% is defined for achieving a CLO by the student. All the record of student’s attainment is kept in the course folders of each course in the department OBA cell. Samples of Course Learning Outcomes for Theory and Lab course with Blooms Taxonomy levels are shown below.



CLO

**attainment <**

**KPI**



**Measurement of CLOs**



**No corrective action**



**Review of Assessment Methodology**



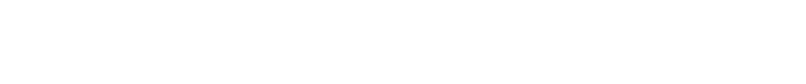
**Review CLOs, BT and PLOs**



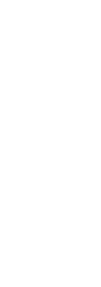
**Review by Teaching Interest Groups**



**Revision of Course Content**



**Approval by BoS, BoF, CAB and ACM**



No



Yes

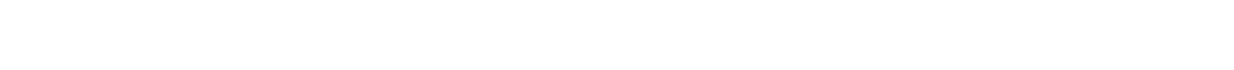


Figure Review process and corrective action implementation for CLOs

**PAF- KARACHI INSTITUTE OF ECONOMICS & TECHNOLOGY**

**LINEAR CONTROL SYSTEM**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Instructor: Dr. Muhammad Bilal Kadri**

**Email Address** [**bilal.kadri@pafkiet.edu.pk**](mailto:bilal.kadri@pafkiet.edu.pk)

**Course Code EE-3411**

**Credit hours 3+1**

**Pre-requisite(s) Signals and Systems**

**Contact hours Tuesday 10:30 am – 11:30 am or by appointment**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Course Objective**

This course is aimed to build a comprehensive foundation in the analysis and design of control systems using classical and modern techniques.

**Contents**

A first course in linear control system. The objective of this course is to teach the mathematical modeling and control of linear dynamical systems. Discussion on transient and steady state behavior along with stability analysis will be dealt in detail.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Mapping of CLOs and PLOs** |  |  |
| **Sr. No.** | **Course Learning Outcomes (CLOs)** | **Program**  **Learning**  **Outcomes (PLOs)** | **Bloom’s Taxonomy** |
| CLO\_1 | Be able to **apply** modeling techniques to develop electrical, mechanical transfer functions. Be able to **construct** the block diagrams, and state variable representation. Should be able to i**nterpret** the first and second order systems. The gained knowledge can be applied to physical systems. | PLO\_1 | C3 (Applying) |
| CLO\_2 | **Analyze** the stability of physical systems. Explain the steady state behavior. Be able to **analyze** the transient response of physical systems using root locus techniques. | PLO\_2 | C4 (Analyzing) |
| CLO\_3 | Be able to **assess** the most suitable feedback controller (PIPD, PID) for the specific problem in hand. Be able to **evaluate** the stability margins using Bode plots. | PLO\_3 | C5 (Evaluating) |

**CLO-PLO Mapping Matrix**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **PLO** | **CLO-1** | **CLO-2** | **CLO-3** |
| PLO-1 | Engineering knowledge |  |  |  |
| PLO-2 | Problem Analysis |  |  |  |
| PLO-3 | Design/Development of solution |  |  |  |
| PLO-4 | Investigation |  |  |  |
| PLO-5 | Modern Tool usage |  |  |  |
| PLO-6 | The Engineer & society |  |  |  |
| PLO-7 | Environment & sustainability |  |  |  |
| PLO-8 | Ethics |  |  |  |
| PLO-9 | Individual and Team work |  |  |  |
| PLO-10 | Communication |  |  |  |
| PLO-11 | Project Management |  |  |  |
| PLO-12 | Lifelong Learning |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Assessment tools** | **CLO\_1** | **CLO\_2** | **CLO\_3** |
| **Assignment + CEP** | 5% (3) | 3.5% (2) | 1.5% (1) +5% |
| **Quizzes** | 5% (3) | 3.5% (2) | 1.5% (1) |
| **Midterm Exam** | 20% | 5% | 0% |
| **Final Exam** | 15% | 15% | 20% |

|  |  |
| --- | --- |
| **Grading Policy** | |
| **Assessment Items** | **Percentage** |
| **Assignments + Complex Engineering Problem**  **(CEP)** | **10%+5%** |
| **Quizzes** | **10%** |
| **Midterm Exam** | **25%** |
| **Final Exam** | **50%** |

**Text Books:**

**1.**  Control Systems Engineering by Norman Nise 6th Edition

**Reference Books:**

1. Steffani, Savant, Shahian and Hostetter, "Design of Feedback Control Systems" 4th Edition, Saunders College Publications.
2. Katsushiko, Ogata, “Modern Control Engineering,” McGraw-Hill, `5th Edition
3. R. C. Dorf and R. H. Bishop, “Modern Control Systems,” 12th Edition
4. B. C. Kuo, “Automatic Control Systems” 7th Edition

**Course Outline:**

|  |  |  |
| --- | --- | --- |
| **Week** | **Session**  **No** | **Contents** |
| **1** | 1 | Introduction to control problem and basic feedback structure |
| 2 | Feedback structure continue..... |
| 3 | Important terminologies and basic concepts related to Control System |
| **2** | 4 | Modeling of electrical circuits using transfer function approach |
| 5 | Related Example |
| 6 | Modeling of mechanical circuits using transfer function approach |
| **3** | 7 | Related Example |
| 8 | Signal flow graphs and Mason's gain formula |
| 9 | Conversion of a block diagram into signal flow graphs |
| 10 | Applying Mason’s gain formula, example 1 |
| **4** | 11 | Applying Mason’s gain formula, example 2 |
| 12 | Feedback control system characteristics |
| **5** | 13 | Laplace Transform (review) |
| 14 | Performance of feedback system: 1st order system |
| 15 | Impact of pole location on the time response and concept of time constant |
| **6** | 16 | Performance of feedback system 2nd order system |
| 17 | Concept of rise time, settling time, percentage overshoot and peak time |
| 18 | Concepts of stability and the Routh stability criterion |
| **7** | 19 | Case 1: Zero in the first column. Case 2”: Complete row of zeros. |
| 20 | Determining the gain ‘K for stability using Routh’s criteria |
| 21 | Introduction to State Space Modeling |
| **8** | 22 | Modeling of an electric circuit using state space modeling technique |
| 23 | Converting a state space representation into transfer function |
| 24 | Signal flow graph from the state equations |
| **MIDTERM EXAMINATION** | | |
| **9** | 25 | Introduction to steady state behavior for open loop and closed loop systems |
| 26 | Describing the steady state error using final value theorem. Static error constants Kp,  Kv and Ka |
| 27 | Types of inputs and impact on the steady state error |
| **10** | 28 | System type and impact on the steady state error |
| 29 | Relationship of static error constants, types of inputs and system type |
| 30 | Introduction to root locus. Why root locus is required? |
| **11** | 31 | Steps for designing the root locus, Symmetric property, Staring and Ending point, number of branches etc. |
| 32 | Calculating the asymptotes to determine the behavior at infinity |
|  | 33 | Finding the break away and break in point |
| **12** | 34 | jw crossing on a root locus |
| 35 | Angle of arrival and departure of poles and zeros |
| 36 | Finding the gain ‘K’ at a point on the root locus |
| **13** | 37 | Solved example of root locus |
| 38 | Controller Design Introduction to different types of controllers and their transfer functions |
| 39 | PD Controller Design (Part 1) |
| **14** | 40 | PD Controller Design (Part 2) |
| 41 | Introduction and brief description of PI Control Design |
| 42 | Introduction and brief description of PID Control Design |
| **15** | 43 | Controller design: phase-lead, phase-lag, and lead-lag controllers. |
| 44 | Frequency-Response approach and Bode plots |
| 45 | Gain and Phase Margin using Bode Plots |

**PAF KARACHI INSTITUE OF ENGINEERING AND TECHNOLGY**

**College of Engineering**

**Course: Linear Control System Lab**

**Credit Hours: 3+1**

**Course Code (L): EE-3411**

**Instructor: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Email Address: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Pre-requisite(s): Signal and Systems**

**Contact Hours: 3 Hours/week**

**Objectives:**

The lab aims to build a comprehensive foundation in the analysis and design of control systems using different Hardware and Software tools such as MATLAB.

|  |  |  |  |
| --- | --- | --- | --- |
| **Mapping of CLOs and PLOs** | | | |
| **Sr. No** | **Course Learning Outcomes** | **PLOs** | **Bloom’s Taxonomy** |
| **CLO1** | Recall the associated concepts form theory regarding the Control system, their response, transfer function, error correction, and controller designing techniques. | **PLO1** | C1 (Recall) |
| **CLO2** | Be able to model and analyze first and second order electrical and mechanical systems, Ball and Beam, Magnetic Levitation and Process control trainer by finding their transfer function, and theiropen loop and closed loop response by applying different test inputs (step, ramp etc.) | **PLO2** | C4 (Analysis) |
| **CLO3** | Be able tomodel and simulate first and second order electrical and mechanical systems, Ball and Beam, Inverted Pendulum, Magnetic Levitation and Process control trainer by using Matlab and Simulink | **PLO5** | C3(Apply) |
| **CLO4** | Investigating the system behavior for Designing and computationof Compensators and Controllers, to meet desired system performance characteristics | **PLO4** | P3 (Guided Response) |
| **CLO5** | Design/Develop solutions for complex engineering problems covered under the scope of this course. | **PLO3** | **P4** (Mechanism) |
| **CLO6** | Assume responsibility and the use of resources to complete the assigned task with proper Teamwork. | **PLO9** | **A3(**Assume responsibility**)** |
| **CLO7** | Properly handle lab infrastructure with safety precautions. | **PLO8** | **P2** (Set) |

**Contents:**

**Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Lab Instructor: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Theory Teacher: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment tools** | **CLO1** | **CLO2** | **CLO3** | **CLO4** | **CLO5** | **CLO6** | **CLO7** | **Assessment** |
| Lab Manual | 3% | 6.80% | 8.17% | 6% | 0% | 3% | 3% | 30% |
| Lab Exam | 0% | 10% | 5% | 10% | 0% | 0% | 5% | 30% |
| Lab Project | 0% | 0% | 0% | 0% | 35% | 5% | 0% | 40% |
| Total | 3% | 16.80% | 13.17% | 16% | 35% | 8% | 8% | 100% |

|  |  |
| --- | --- |
| **Grading Policy** | |
| Lab Manual | 30% |
| Lab Exam | 30% |
| Lab Project | 40% |

**Recommended Book:**

•. Control System Engineering by Norman S. Nise 6th Edition

**Reference Books:**

•. Modern Control Engineering by Katsuhiko Ogata 5th Edition

**Administrative Instructions:**

* According to institute policy, 80% attendance is mandatory to appear in the final examination but 100% will be expected. Approved leaves will not be considered towards attendance.
* Every student should bring calculator and manual in each lab.
* Every student is expected to be in lab before schedule starting time.

In design-oriented project work, the students deal with problems that can be solved by theories and knowledge they have acquired in their previous lectures. (Design Problems).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Labs** | **CLO** | **Marks** | **Sign** |
| 1 | Introduction to MATLAB | CLO (1,3,6,7) |  |  |
| 2 | Modelling and Analysis of Electrical and Mechanical system | CLO (1,2,3,6,7) |  |  |
| 3 | Modeling and analysis of First Order Systems and their behavior at different inputs | CLO (1,2,3,6,7) |  |  |
| 4 | Modeling and analysis of Second Order Systems and their behavior at different inputs | CLO (1,2,3,6,7) |  |  |
| 5 | Introduction to ball and beam system. | CLO (1,2,3,6,7) |  |  |
| 6 | Understanding the open and close loop Response of DC Motor. | CLO (1,2,6,7) |  |  |
| 7 | On/Off controller design for temperature control system | CLO (1,4,6,7) |  |  |
| 8 | Proportional controller design for level control system. | CLO (1,2,3,4,6,7) |  |  |
| 9 | Applying Ziegler-Nichols PID tuning rule to control the position of Ball on the Beam. | CLO (1,3,4,6,7) |  |  |
| 10 | Lead Compensator design via root locus to for Inverted Pendulum system. | CLO (1,3,4,6,7) |  |  |
| 11 | Lag Lead Compensator Design via root locus for inverted pendulum system. | CLO (1,3,4,6,7) |  |  |
| 12 | Obtaining Bode plots of linear Circuits | CLO (1,2,3,6,7) |  |  |
| 13 | PID controller design for magnetic levitation system | CLO (1,3,4,6,7) |  |  |
| 14 | Design-Oriented Project Work | CLO  (2,3,4,5,6) |  |  |
| 15 | Final Lab Exam | CLO (2,3,4,7) |  |  |

# Criterion 4 - Students

## Admission Criteria

The selection criteria for admission into the Bachelor of Mechatronics Engineering degree program are strictly in accordance with the one prescribed by PEC.

**Eligibility for Admission**

A candidate seeking admission in BE Mechatronics degree program must fulfill the following eligibility requirements:

HSSC / A-Level / Equivalent (Physics, Chemistry and Mathematics) Minimum 60%

**Eligibility Requirements for Diploma Holders (DAE)**

Diploma of Association Engineer in relevant discipline Minimum 70%

**Selection**

Admission is granted absolutely on merit determined on marks obtained in the following examination and according to the weightage given to respective examinations:

**Weightage for HSSC**

* + - SSC/ O-Level / Equivalent 10%
    - HSSC / A-Level / Equivalent Percentage 40%
    - Admission Test 50%

## Admission response and %age admitted

|  |  |  |  |
| --- | --- | --- | --- |
| **Year** | **Applications Received** | **Students Selected** | **% of Students Selected** |
| 2017 | 100 | 25 | 25% |
| 2018 | 147 | 37 | 25% |
| 2019 | 184 | 23 | 15% |
| 2020 | 116 | 18 | 16% |
| 2021 | 164 | 33 | 20% |

## **Intake**

Available capacity in a semester is about 40 students per year. The number of students admitted in the last four years:

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | **Details of Intake of Stu** | **dents** |
| **S No** | **Batch** | **No. of students** | **Present Strength (Active Students)** |
| 1 | 2017 | 25 | 14 |
| 2 | 2018 | 37 | 29 |
| 3 | 2019 | 23 | 19 |
| 4 | 2020 | 18 | 18 |
| 5 | 2021 | 33 | 31 |

## **Policy for Credit Transfer and Exemption**

* 1. Credits can only be transferred from a PEC accredited program.
  2. A candidate must obtain 72 marks or “B” grade in the equivalent course to apply for transfer/exemption at KIET.
  3. A 25 % of total courses credit hours in the program will be considered for exemption for any Degree program.
  4. The transfer/ exemption of course is only granted if the course has same credit hours and matching course content as the corresponding course at KIET.
  5. Level of degree shall be same, i.e. a bachelor level course completed elsewhere does not make one eligible for exemption for master coursework.
  6. Course and credit hour exemptions are only offered if a student is applying in the same degree at KIET.
  7. If a student has completed the same course in a different degree earlier, the academic content of that course may be transferred if the course content is matched. In this case, student must do substitute course(s) to fulfill the credit hour requirement.
  8. Exemption/transfer in courses is not offered in MS and M.Phil degrees at KIET.
  9. Student may be tested through examination process at KIET for every course in which one is claiming exemption to check the level of knowledge before the course and its credit hours are transferred.
  10. Course exemption fee is charged on courses exempted/transferred. Fee of Rs. 2000/- per exemption shall only be charged if course and corresponding credit hours are transferred.
  11. Internship and project courses are excluded from transfer/ exemption policy.

## Semester academic load

Academic load for each semester is given in the following table.

|  |  |
| --- | --- |
|  | **Semester Load (CH) per semester** |
| **Semester #** |  |
| 1 | **17** |
| 2 | **17** |
| 3 | **18** |
| 4 | **17** |
| 5 | **18** |
| 6 | **18** |
| 7 | **17** |
| 8 | **18** |
| **Total** | **140** |

## Completion of courses

* “Course Progress Monitoring System” monitors the course completion.
* Academic Support Staff updates course progress monitoring report on daily basis.
* Faculty maintains course folders to log the session completion.

## Student Activities/ Participation in Engineering Events

Some of the Past Events under the Category of Collaborative Programs at KIET

1. IEEE KIET Student Branch awarded 2nd Place for most Quality events and activities organized during 2020
2. Chair of IEEE PAF-KIET Student Branch, awarded Best Chair Award by IEEE Karachi Section
3. Branch Advisor of IEEE PAF-KIET Student Branch and Project Coordinator of IEEE Karachi Section SAC, awarded Best Volunteer Award by IEEE Karachi Section.
4. Five IEEE KIET SB members are selected for  SAC Karachi Section Team for the tenure of (2021-2022).
5. IEEE KIET student branch managed to support SAC IEEE Karachi section events for technical support.
6. SP18: Team Technocrats Winner of Robothon in Lahore in 2020
7. Team Technocrats Winner of Creativo Robotics Competitions CRC-1 and CRC-4 in 2021
8. IEEE PAF-KIET Student Branch awarded 2nd Place for most Quality events and activities organized during 2020
9. Chair of IEEE PAF-KIET Student Branch, awarded Best Chair Award by IEEE Karachi Section
10. Branch Advisor of IEEE PAF-KIET Student Branch and Project Coordinator of IEEE Karachi Section SAC, awarded Best Volunteer Award by IEEE Karachi Section
11. SP18: Team Technocrats winner of LFR Competition in Why-Phy 4.0 in IoBM in 2020
12. Team Technocrats Runner Up of Circuit Designing Competition in Why-Phy 4.0 in IoBM in 2020
13. SP18: IEEE PAF-KIET Student Branch organized first Online Workshop, Mastering Arduino, in 2020
14. In PROCOM Fast University, SPEC AND SENTEC in NED University, NERC NUST Islamabad, PHY-WHY in IoBM University, Airtech in Air University Islamabad.
15. Champion Trophy in IST Islamabad
16. Procom’19 (FAST University) Line following Robot + speed wiring (Winner in both competition)
17. NERC’19 (NUST University) Line following Robot (winner)
18. SPEC’19 (NED university) Line following Robot and Circuit designing (Winner in both competition)
19. SENTEC’19 (NED university) Line following Robot (Winner in both competition)
20. AIRTECH’19 (Air University) Line following Robot (Winner)
21. Robo War (Runner up)
22. IST Youth Carnival’19 (Institute of Space and Technology), Champions (Won several technical competition and declare champions)
23. IOBM’19 , Line following Robot (Winner) , Circuit designing (Runner up)
24. EDVON’19 (Edvon Robotics), Line following Robot (Winner) , Sumo wars (Runner up)
25. SIBACOM’19 (IBA Sukkar), Line following Robot (Runner Up)
26. GEARS’19 (PAF-KIET), Line following Robot + Robo Maze + Bash of bots (Winner in all competition)
27. SPEC’19 (PAF-KIET), Line following Robot (winner) , Robo maze (Runner up)
28. IOBM’20 , Line following Robot (winner)
29. University of Lahore 20, Line following Robot (winner)
30. LUMS hosted a Five days National ICT R&D Workshop on "Electronic Circuits for Instrumentation and Measurement" on 27th - 31st August, 2018 at LUMS Lahore.
31. CoE students participated and won 1st Position in "Line following robot Advance" NED SPEC 18 Competition, on 07th August, 2018 in NEDUET.
32. Two more stars of College of Engineering, KIET participated in NEDMUN-V held from 13th - 15th July, 2018 and achieved the "Outstanding Diplomacy Award" at NEDUET.
33. National University of Science and Technology (NUST) hosted "16th National Engineering Robotics Contest (NERC-2018)", held on 03th - 08th July, 2018 at NUST, Islamabad where College of Engineering Students actively participated in "Robo War Competition".
34. College of Engineering organized "Semester Project Exhibition & Competitions" (SPECSpring-2018) held on 23rd April, 2018 at KIET (Main Campus).
35. Two teams from College of Engineering's students participated in 13th National Design, Build and Fly Competition -2018 (DBFC-13) and got marvelous achievement, held on 13th - 15th April, 2018 at GIK Institute of Engineering and Sciences & Technology.
36. KIET hosted a 2 day International conference sponsored by IEEE on "*2017 First International Conference on Latest trends in Electrical Engineering and Computing Technologies (Intellect 2017)"* on 15-16 November 2017 in Karachi.at main campus.
37. College of Engineering organized Student Engineering Exhibition "*Breaking the barriers through innovation*" a 2 national event held on 06-07 November 2017 in Karachi.at KIET (Main Campus).
38. Workshop on "Programmable Logic Controllers (PLCs) held on 01st February, 2017 at CoE KIET.
39. Seminar on First aid and Fire Safety training held on 31st January, 2017 at CoE KIET.
40. “Semester Project Exhibition & Competition Fall-16, 9th December, 2016, Organized by CoE.
41. Seminar on Aerospace System Modelling - Digital DATCOM and MATLAB, 6th December, 2016, Organized by College of Engineering.
42. Seminar on “IEEE insights for you", 01st December, 2016, organized by CoE.
43. Seminar on “Applications of Remote sensing and Geo-Information Science” on Thursday 1st December, 2016
44. Seminar on Integrated Circuits, Microsystems and Supporting Technologies, Exploration of Mutual collaboration with KIET and other Pakistani Higher Education Institutes held on 17 – 18, November, 2016 at KIET.
45. Workshop on “LabVIEW” on November 11, 2016, Organized by College of Engineering.
46. Workshop on "Exploring MATLAB" on November 08, 2016, Organized by College of Engineering.
47. “KIETMUN’16” held on 3 – 5 November, 2016 at KIET
48. “SENTEC Robo Soccer” - 2016 held on the 19 – 21 July 2016, at NEDUET Karachi.
49. “Robomania Summer Camp 2016” held on 22 – 26 July 2016 , at KIET
50. “PROCOM” Robo Race held on the 6thApril 2016, held at FAST- NUES Main Campus Karachi.
51. “HVAC EXPO and Conference 2016” held on the 3 – 5 March 2016 at Expo Center Karachi

1. “NEO’16 GIKI Line Following” held on 29th-31st Jan 2016 held at GikiTopi KPK
2. “SENTEC 2015 Line Following Robots” held on 11 - 12 August 2015 held NEDUET Karachi
3. "Robosprinit 2015 SEE Student Engineering Exhibition" held on held 7 – 8 November 2015 held at Sports Activity Center KIET Main Campus
4. “RoboSprint Seminar under National Education Campaign”, held from 1st to 4th June, 2015 at KIET City Campus
5. “ROBO-CAMP (Summer Academy)” held from 1st to 5th June, 2015, at KIET City Campus, KRC CoE
6. “Semester Project Exhibition & Competition Spring-15, 4th May, 2015, Organized by CoE.
7. “KRC intro, Robotics Competitions across Pakistan” held on 29th April, 2015, at KIET
8. “Robot Design 101 S5 Programming 2” held on 22nd April, 2015, at KIET
9. “Robot Design 101 S4 Programming 1” held on 15th April, 2015, at KIET
10. “Robot Design 101 S3 Electronics of Robots” held on 25th March, 2015, at KIET
11. “Robot Design 101 S2 Mechanical Design” held on 18th March, 2015, at KIET
12. “Robot Design 101 S1 What? Why? How?” held on 11th March, 2015, at KIET
13. “Robotics - Actuator and Sensor” held on 4th March, 2015, at KIET
14. “Robotics - Across the different domains Analog + Digital + Instrumentation” held on 18th February, 2015, at KIET
15. “Basic Electronics Circuit” held on 11th February, 2015, at KIET
16. “Importance of Robotics for Electrical Engineer” held on 4th February, 2015, at KIET
17. Students Project Exhibition & Competition Fall-14, 28th November, 2014, Organized by CoE.
18. “Student Engineering Exhibition – 2014” held on 13th – 14th October, 2014, at KIET
19. “IEEEP Fair 2014’ held on 09th – 11th Sep, 2014, at Expo Centre
20. “KIETMUN – 2014” held on 19th – 21st September, 2014, at KIET
21. “National Robosprint – 2014” held on 17th – 20th September, 2014, at CASE
22. “Student Project Exhibition & Competition ’14” held on 24th April, 2014, at KIET
23. “FASTECH’14” held on 11th March, 2014, at FAST-NUCES
24. “Punjab Youth Festivl’14” held on 22nd – 28th Feb, 2014, at Sport Board Punjab
25. “CBMUN’14” held on 7th – 9th February, 2014, at IoBM
26. “National Electronix Olympaid’14” held on 31st Jan – 2nd Feb, 2014, at GIKI
27. “Model UN Conference (IBAMUN-2014)” held on 31st Jan – 2nd Feb, 2014, at Organized by IBA.

**Events/Seminars/Exhibitions Attended by Faculty Members/Students**

|  |  |  |  |
| --- | --- | --- | --- |
| **Name of Exhibition** | **Name of Institute** | **Date of Exhibition** | **Duration** |
| National ICT R&D Workshop on  "Electronic Circuits for Instrumentation and Measurement | LUMS, Lahore | August  27th-31st, 2018 | Five Days |
| NED SPEC 18  Line following Robot Advance | NEDUET | August  07th, 2018 | One Day |
| NEDMUN-V | NEDUET | July  13th-15th, 2018 | Three Days |
| 16th National Engineering Robotics Contest (NERC 2018). | National University of Sciences and  Technology (NUST  Islamabad) | July  03rd -08th, 2018 | Three Days |
| Semester Projects Exhibition &  Competitions (SPEC-Spring 2018) | KIET | April  23rd, 2018 | One Day |
| 13th National Design, Build and Fly  Competition - 2018 (DBFC-13) | GIK Institute of  Engineering  Sciences &  Technology (GIKI) | April  13th-15th, 2018 | Three Days |
| IEEE Intellect 2017 | KIET | November  15th - 16th, 2017 | Two Days |
| Student Engineering Exhibition "Breaking the barriers through innovation" | KIET | November  06th - 07th, 2017 | Two Days |
| Semester Projects Exhibition & Competitions (SPEC-Fall 2016) | KIET | December  09th, 2016 | One Day |
| Alumni Dinner | KIET | November  12th, 2016 | One Day |
| KIETMUN’16 | KIET | November  4th - 6th, 2016 | Three Days |
| SENTEC 2016 Robo Soccer | NEDUET Karachi | July  19th – 21st, 2016 | Three Days |
| Robomania Summer Camp 2016 | KIET | July  22nd-26th ,2016 | Four Days |
| PROCOM Robo Race | FAST- NUES Main Campus Karachi | April  07th 2016 | Two Days |
| HVAC EXPO and Conference 2016  Student Project Exhibition | Expo Center Karachi | March  3rd – 5th, 2016 | Three Days |
| NEO’16 GIKI Line Following | GIKI, Topi, KPK | Jan 29th-31st, 2016 | Three Days |
| Robosprinit 2015 SEE the Robosprinit | KIET Main Campus | November  6th – 8th, 2015 | Three Days |
| Robosprinit 2015 SEE Student Engineering Exhibition | Sports Activity Center  KIET Main  Campus | November  7th – 8th, 2015 | Two Days |
| SENTEC 2015 Line Following Robots | NEDUET Karachi | August  11th - 12th, 2015 | Two Days |
| RoboSprint Seminar under National Education Campaign | KIET  (City Campus) | June  1st- 4th, 2015 | Four Days |
| ROBO-CAMP (Summer Academy) | KIET  (City campus) | June  1st- 5th, 2015 | Five Days |
| Student Project Exhibition and Competition [Spring 2014] | KIET | May 4,2015 | One Day |
| KRC intro, Robotics Competitions across Pakistan | KIET | April  29, 2015 | One Day |
| Robot Design 101 S5 Programming 2 | KIET | April  22, 2015 | One Day |
| Robot Design 101 S4 Programming 1 | KIET | April  15, 2015 | One Day |
| Robot Design 101 S3 Electronics of Robots | KIET | March 25, 2015 | One Day |
| Robot Design 101 S2 Mechanical Design | KIET | March 18,2015 | One Day |
| Robot Design 101 S1 What? Why? How? | KIET | March 11, 2015 | One Day |
| Robotics - Actuator and Sensor | KIET | March 4, 2015 | One Day |
| Robotics - Across the different domains Analog + Digital + Instrumentation | KIET | February 18, 2015 | One Day |
| Student Project Exhibition and Competition [Fall 2014] | KIET | November  28,2014 | One Day |
| Student Engineering Exhibition – 2014 | KIET | October  13 – 14, 2014 | Two Days |
| IEEEP Fair 2014 Expo Centre | IEEEP Karachi Centre | September  09 – 11, 2014 | Three Days |
| National Robosprint – 2014 | CASE  Islamabad | October  17 – 20, 2014 | Four Days |
| KIETMUN – 2014 Conference | KIET | September  19 – 21, 2014 | Three Days |
| Student Project Exhibition & Competition – SP-2014 | KIET | April  24, 2014 | One Day |
| SPEC | NEDUET | March 31, 2014 | One Day |
| FASTECH’14 | FAST-NUCES | March 11, 2014 | One Day |
| National Electronix Olympaid’14 | GIKI | January 31 to  February 2, 2014 | Three Days |
| IBAMUN-2014 | IBA | January 31 to  February 2, 2014 | Three Days |
| GIKI Innovation Summit’13 | GIKI | November 29 to December 2, 2014 | Four Days |

## Evaluation of Student Performance and Remedial Measures

The management obtains students’ perception about courses each semester through an appraisal system. The students rate the courses for:

* Quality of instruction
* Course contents
* Extent of coverage
* Use of teaching aids

See **Annexure 7.4** for details of Student's Feedback.

Besides this appraisal, there is an on-line appraisal system as well.

The management uses the information combined with evaluation of courses by students, peer faculty and departmental heads for faculty appraisals. These evaluations greatly help in the development of the faculty and the course contents.

# Criterion 5 – Faculty and Support Staff

## Strength and Quality of Faculty

The Faculty in the Department of Mechatronics is highly qualified. The faculty is involved in teaching, research and industrial R&D. Focused areas of teaching and research are:

* Robotics and Automation
* Applied Control
* Computational Fluid Dynamics model of commercial and military aircrafts

Presently Mechatronics department has three Doctorate and five Masters Degree holders as its full-time faculty from renowned foreign and national universities.

The details of strength and quality of faculty (permanent as well as shared) associated with College of Engineering is given at Annexures I and J.

### Full-time Faculty

The composition of regular, full-time faculty teaching core subjects is as follows:

Ph Ds: 03 28%

ME/MS/M Sc (Engg): 05 45 %

BE/BS/BSc (Engg): 03 27%

Higher qualified and experienced faculty teaches relatively difficult core courses. The details of strength and quality of full-time engineering faculty associated with Mechatronics department is given at Annexures I and J.

### Part-time (over and above Full time) Faculty

The part-time faculty members include distinguished industry professionals and holders of academic credentials from renowned national/international universities.

The institute hires visiting faculty on semester-to-semester basis depending upon subject specialty requirements and full-time faculty’s course load.

At present 1.75 % of the engineering faculty is in part-time category.

The composition of the part-time (over and above full time) faculty associated with College of Engineering is available at Annexures I and J.

### Shared Faculty

The College of Engineering utilizes services of shared faculty on semester-to-semester basis depending upon subject specialty requirements and full-time dedicated faculty’s course load.

The composition of the shared Humanities & Sciences faculty is as follows:

* Ph Ds: 01 08%
* Masters: 11 92%
* Graduates: -

The details of strength and quality of shared Humanities & Sciences faculty associated with College of Engineering is given at Annexures I and J.

### Academic Qualification

The Institute maintains a reasonable balance of qualifications, experience and professional competence in the faculty assigned to College of Engineering.

Following are the designations of faculty and their selection eligibility criteria.

|  |  |
| --- | --- |
| **Professor** | PhD degree with eight years teaching experience at university level with fifteen publications in HEC approved journals |
| **Associate Professor** | PhD/MS degree with 5-7 year teaching experience at university level |
| **Assistant Professor** | PhD/MS degree with 5 year teaching experience at university level |
| **Lecturer** | MS Degree or equivalent with some teaching experience |
| **Lab Engineer** | BE Mechatronics/Electrical/Mechanical/Electronics or equivalent degree |

Following is the faculty qualification breakup:

|  |  |  |  |
| --- | --- | --- | --- |
| **S No** | **Qualification** | **Qualified Faculty** | **Percentage** |
| **1** | **Ph D** | **02** | **20%** |
| **2** | **ME / MS / M Sc / M Phil** | **06** | **60%** |
| **3** | **BE / BS (Engg) / B Sc (Engg)\*** | **02** | **20%** |

Note: \* Most of the faculty has registered themselves as Master students at KIET or elsewhere.

## Faculty Training for OBE implementation

|  |  |  |
| --- | --- | --- |
| **Title/ Trainer** | **Attendees** | **Date / Venue** |
| Online OBE grading system  – Brain Storming/ Kamran  Ali Khan | Dr Imran Naseem, Dr Husain Parvez, Dr Bilal Kadri, Saba  Javed, Ejaz Tayyab, Farrukh  Shahid, MIS team | 03rd-October-2017  (Syndicate) |
| OBE Fundamentals and Implementation/ Dr Imran Naseem, KIET | All Electrical Engineering, Avionics Engineering and  Mechatronics Engg Faculty | 18th-April-2018  (Syndicate) |
| Demonstration of OBE grading system on MIS/ Dr Imran Naseem, MIS Team | All Electrical Engineering, Avionics Engineering and  Mechatronics Engg Faculty | 01st-August-2018  (Syndicate) |
| OBE Implementation / Dr Jameel Dean FEAS, Ripah International University  Islamabad | All Electrical Engineering, Avionics Engineering and  Mechatronics Engg Faculty | 21 June 2018 / KIET Main Campus (2ND CPD OBE  Workshop) |
| Outcome based engineering education (obe), complex problems & a case study in project oriented problem based learning (popbl) / Azlan Abdul Aziz, Universiti Putra Malaysia  (Academic Advisor & Former Director,  Engineering Accreditation  Department, Board of  Engineers, Malaysia | Mr Ashar Qureshi (Electrical Engineering Department)  Mr Duraid (Mechatronics  Deparment) | 5th December 2017/ Mehran University of Engg and Tech  (MUET), Jamshoro |

## Faculty Development Program

The Institute encourages higher education and professional enhancement for the faculty. Through a faculty development & incentive plan, the institute partially bears the tuition expenses incurred on higher education and offers higher education opportunities through KIET’s own degree programs; both for faculty and other staff members, at subsidized rates. Mindful of the fact that it is difficult to find suitable faculty with PhD degrees, the institute has, therefore, introduced a new framework for faculty development and its own MS/PhD program to provide the facilities and infrastructure necessary for research hoping that these initiatives will go a long way to develop faculty.

At present two faculty members have registered themselves in PhD program whereas one faculty member is at various stages of completing her Master program.

* Registered in PhD: 01
* Registered in MS: 02
* Completed MS: 01

### Establishment of R&D Fund:

To promote R&D activities at KIET, an R&D Fund has been established. A sum of Rs.1800/= per student per year is being collected for the fund. The Fund is being used in the following areas:

* R&D Projects
* Faculty Development and Conferences
* Publications & Awards

The BASR recommends the utilization of the Fund. Final authority for utilization of Fund rests with the President KIET.

## Interaction with industry and professional institutions

Consultation and research work for industry/ professional institution may be considered for all faculty promotion and awards. Honorary higher designation may be granted to highly motivated senior faculty members unable to fulfill the minimum requirement for promotion.

Industry interaction includes but not limited to arranging conferences/seminars/guest speaker sessions/extra-curricular activities at KIET in collaboration with the industry. These activities shall be duly recognized and rewarded by the Institute.

**Note:**

The above-mentioned incentives for research papers and publications are applicable only one time for each paper/publication

If a research paper is accepted at a Conference or a Seminar the concerned faculty member may be allowed to attend the conference at the Institute’s expense

All the promotions and awards are subject to the condition that the credibility of the faculty member as a teacher/research worker is well established

## Evaluation Criteria

The criteria for differentiating and evaluating the faculty for promotions and increments is based on:

* Interaction as a member of the faculty
* Industry Interactions
* Teaching & Research
* Organizational Development

A performance evaluation report (APR) has also been introduced to measure and assess the professional development of the faculty. See Annexure 3.1.6C to view the extracts of PAR.

## Consultancy Framework

To provide an incentive system for faculty that goes beyond salaries and benefits and that promotes interactions with industry, universities typically make use of the consultancy framework. The system encourages the faculty to take up consultancy assignments that provides for greater exposure to faculty about the industry problems, enriches their experience, provides students with concrete illustrations and provides material for research publications.

KIET understands the need to institute a consultancy service framework similar to that in vogue in universities like LUMS with strong R&D programs. The framework needs to ensure that:

Consultancy projects should not disturb regular teaching sessions of the faculty.

The consultancy projects should pay for a specified percentage for office facilities, utilities and other overheads. It is proposed that 20% of the revenues from the consultancy projects be given to KIET for such expenses

Other direct additional expense like travel and long-term calls be paid by faculty

## Teaching and Research Load

The teaching loads for the Professors, Assoc Prof., Astt. Prof. and Lecturers are assigned in accordance with the PEC guidelines. The recommended teaching load for a regular full-time faculty member is 12 Cr Hrs / week. The teaching loads for the Director, HoDs etc. are comparatively lesser due to the nature of their appointment. The average teaching load remains around 11.6 credit hours.

### Teaching Load in terms of Courses (3 Cr Hr Course)

* Professor: Two courses per semester
* Associate Professor: Three courses per semester
* Assistant Professor: Three/ Four courses per semester
* Lecturer: Four courses per semester

### Teaching Load in terms of Credit Hours

* Professor: 6 CrHrs/week
* Associate Professor: 9 Cr Hrs/week
* Assistant Professor: 12 Cr Hrs/week
* Lecturer: 14 Cr Hrs/week
* Lab Engineer: 6 Cr Hrs of Labwork per/ week

## Student/Teacher Ratio

Mechatronics Students (Active in Fall 2019)=109

**\*Full Time Dedicated Faculty (FTDF):**

|  |  |  |
| --- | --- | --- |
| Full Time Faculty (FTDF): |  | 07 |
| Shared to other Engg Departments (Avionics and Electrical): |  | 01 |
| Shared Faculty from other Engg Departments (Avionics and Electrical): |  | 03 |
| Shared Faculty from Humanities and Management Sciences: |  | 05 |
| BE qualified: |  | 02 |

###### Countable Faculty

=7+Min(25%x7, 50%x(1+3+5)) + Min(20%x7,50%x2)

=7+Min(1.75,4.5)+Min( 1.4, 0.25)

=7+1.75+0.25

=9.0

###### Student/Teacher Ratio For Active Students

=99/9=11

**\* As per Section 3.2.5.2 of 2014 OBE based Accreditation Manual: FTDF can be post graduate qualified with PEC number teaching solely in that department. A non-Engr PhD can be counted towards faculty up to 20% of FTDF**

## Faculty Research

Besides teaching, the faculty takes research as their commitment to the institutional goals. The institute provides environment conducive for research, consequently faculty members are engaged in research projects leading to publications and new hardware.

The faculty members involved in research have less teaching load to enable them to concentrate more on research output. The junior faculty also actively participates in research activities; however, junior faculty’s focus is more towards teaching and semester projects. The institute promptly acknowledges the research through a reward mechanism.

It was due to the research commitments that the institute was able to attract handsome funding by ICT R&D fund; both for faculty and student projects.

### Research and Publications

[The](http://www.pafkiet.edu.pk/STATIC/MS_Engineering_Telecom.htm) Graduate School of Sciences & Engineering (GSSE) provides the platform and the framework for research by faculty and students. The objectives are:

* To develop a culture of research where faculty and students are involved in investigation and research of the fundamental problems of industry and society.
* To produce a real and measurable impact on society and industry by offering scientific and engineering solutions to their problems.
* To generate impact factor research and publish it in quality research journals
* To develop rigorous and intensive MS and PhD research degree programs
* To develop mutually beneficial industrial and academic collaborations

### Research Culture and Environment

GSSE is committed to promoting research culture, ensuring quality facilities and conducive environment for meeting the stated objectives. For this purpose, following provisions exist:

* Full-time highly qualified PhD faculty with recent publications in impact factor research journals.
* Availability of lab equipment, advanced simulation tools and research funding.
* Research Fellowships for budding PhD students desirous of pursuing research in a full-time capacity.
* Specialized and active research groups in the areas of computer science and electronic engineering.
* Regular workshops on research methodologies, tools and technologies.
* Series of seminars and colloquia by scholars and researchers of International repute.
* Accessibility to a wide range of research archives.
* Advanced and research-oriented courses

### Research Groups:

Six diversified research groups headed by foreign qualified PhD faculty members exist at

GSSE. Group members meet periodically to study, discuss and thrash out relevant research publications, research ideas and proposals. Research groups encompass Signal Processing, Embedded Systems, Robotics, Molecular and Nano electronics, Smart Networks, Software Engineering & Future Generation Computing, Data Mining & Visual Analytics areas.

Faculty of College of Engineering is actively involved in the supervision of research. The faculty has published several research papers in reputed journals, magazines and conferences and many more are in the process.

College of Engineering is publishing an annual journal titled Technology Forces (TF).

## Faculty Research Grant

KIET has received research funding worth 52.383 million in the year 2021 and 14.168 million in the year 2020.

**Research Grants secured by Mechatronics Department**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **#** | **Name of Project** | **R&D Project Funding Agency** | **Grant**  **(PKR)** | | **Status** |
| **1.** | High Precision location identification for multiple applications using deep neural networks by augmenting GPS with terrain knowledge | NCGSA | 14.5 M | Under Review | |
| **2.** | UAV Localization in GPS denied environment | PAF | 2.9 M | In Progress | |
| **3.** | Indigenous development of the flight dynamic model of C-130 aircraft for full flight simulator | PAF | 3 M | Completed | |
| **4.** | Design and development of Intelligent Mobile Robots (IMRs) for disaster mitigation and firefighting | IGNITE | 14.6 M | Completed | |

**Effective Utilization of Research Grant and its Net Outcome**

Effective Utilization of Research Grant and its Net Outcome We utilize the research grant for R&D Projects, Faculty Development and Conferences, Publications & Awards. The faculty also holds and attends conferences/ workshops/ seminars on regular basis. We allocate specific budget for such events.

1. Salaries for Principal Investors, Co-Principal Investors & Researchers.
2. Fees & Stipend for Graduate students.
3. Hardware for research.

## Faculty Publications

The faculty is involved in research and also actively supervising the student research work both at graduate and undergraduate levels. The details of faculty research work is listed in **Annexure N.**

## Faculty Development

**Framework for Faculty Development and Research Incentives**

**Objectives**

To develop the institute as a Center of Excellence in which faculty is motivated to contribute towards:

* **Excellence in teaching standards** by actively participating in the development of courses, curriculum, and instruction methodology
* **Excellence in R&D** through publications in journals and other magazines
* **Faculty development** process that is goal oriented and attracts full-time, highly qualified and industry renowned faculty members, and encourages their continuous development in the system
* **Industry-Academia interactions** through membership in professional associations, participation in conferences, consultancy, industry projects, etc
* **Student-Teacher Interactions** through involvement in academic counseling, student projects and student events and activities
* **Institutional Development** through participation in various committees and their activities and events at the institute

These incentives’ package has been introduced to increase the number of faculty members  
at KIET with PhD qualification; therefore, those who are availing it for MS are expected to  
continue their studies to do PhD. Following two options are available:

OPTION 1:  
a) After meeting all admissions’ requirements of the graduate program at KIET, faculty will  
be given three-credit hour reduction in the semester workload and full fee (tuition and all  
other fees included) waiver for 30 (in case of MS) or 48 (in case of PhD) credit hours.

b) On successful completion of the graduate studies, faculty will be required to work for KIET for at least three (in case of MS) or four (in case of PhD) full semesters; however, they will be appropriately assessed and given promotion in accordance with the service  
rules then.

c) Faculty is required to enroll for at least twelve credit hours of graduate courses every  
year.

d)Faculty is not allowed to teach extra credit hours at PAF-KIET or any other  
institute/university till the completion of studies.

e) The benefits of workload reduction and fee waiver are subject to the satisfactory progress  
of studies to be assessed biannually.

f) Faculty members’ progress reports should be sent by GSSE head to the relevant college  
director before November 15/July 15 for Fall/Spring semester to facilitate the  
colleges in their early planning of next semesters.

g) Workload benefits will be given in consultation with the relevant college director.

h) Faculty may opt to pay back all financial benefits at the fixed rate of Rs 10,000 per credit  
hour and may leave before or immediately after finishing graduate studies.

i) In case of non-teaching staff, only full fee waiver will be given.  
  
OPTION 2:

Existing 55% fee concession policy for PAF-KIET employees.

**Incentives for Faculty Members Pursuing PhD:**

Faculty members who are aspiring to do PhD and meet all its admission requirements and enroll at KIET will be given three credit hour reduction in their semester workload and tuition fee waiver for three years. Following additional incentives may also be offered:

|  |  |  |
| --- | --- | --- |
| **S. No** | **Milestone** | **Benefits** |
| **1** | Publish research in the ‘W’ Category journal of HEC | Workload is reduced further by 3 credit hours for the next semester |
| **2** | Publish research in the ISI web of science indexed journal. | Workload is reduced further by 3 credit hours for the next two semesters |

Note: In academic year only one of the incentives may be credited.

* On successful completion of the PhD program, faculty members are required to work for KIET for at least three years; however, in all such cases they will be appropriately assessed and given promotion in accordance with the service rules.
* Faculty members may opt to pay back all tuition fees and credit hour benefits at the prevalent remuneration rates and may leave before or immediately after finishing PhD.

The benefits of workload reduction and tuition fee waiver are subject to the satisfactory progress of PhD studies.

* Faculty member are allowed to register in short courses to improve their qualification with very nominal charges.
* Faculty members are granted study leave to complete their higher studies at abroad. At the moment there are two faculty members gone abroad for PhD program.
* There is a provision of leave with pay to complete higher studies.
* Faculty is encouraged and facilitated to attend international workshops and conferences.

**FACULTY DEVELOPMENT PROGRAM**

|  |  |  |  |
| --- | --- | --- | --- |
| **S No** | **Name** | **Degree In progress** | **University** |
| 1 | Lecturer Sofia Yousuf Sheikh | MS (Completed) , (PhD in progress) | KIET |
| 2 | Lab Engineer Hafiz Tehreem | MS in progress. | KIET |
| 3 | Lab Engineer Hamza Hamid | MS in progress. | KIET |

The faculty has remained involved in research while pursuing higher academic qualifications. The detail of faculty research work undertaken while pursuing higher education is listed in **Annexure Q.**

## Academic Collaboration

Efforts are continuing to establish collaborative forums with national and international universities for mutual research, training, data exchanges and holding of seminars etc.

* Owing to Pakistan Air Force’s patronage to the institute, collaboration exists with:
  + Pakistan Aeronautical Complex, Kamra
  + College of Aeronautical Engineering, PAF
  + PAF Air War College
  + School of Electronics, PAF K/Creek
  + School of Aeronautics, PAF K/Creek
* Exploiting the auspices of British Council, the institute endeavors to setup affiliation with UK-based institutions in the field of Engineering, Management Sciences, and Computer Sciences.

Dr. Muhammad Bilal Kadri (HOD Mechatronics) is actively involved within industrial research projects. A research grant worth 14.6 million PKR was awarded by IGNITE, Pakistan for the design and development of firefighting robots. The robots were designed with the recommendation and consultation of the Karachi Metropolitan Corporation (KMC).

Dr Kadri along with Lecturer Sofia is working on a classified research project with the Pakistan Air force (PAF). The research grant is worth 2.9 million PKR.

Dr Adil Loya (who served in the Mechatronics department for more than four years and has recently left) was involved in another industrial project related to the simulation of C-130 aircraft.

The HoD along with the Mechatronics faculty members have submitted a research project in NCRA, the industrial collaborator was Data Communications and Controls (DCC), Karachi.

A research project related to accurate controlling and delivering goods using drones have been submitted to NCGSA. The industrial partner is DataLog, Karachi. The project is in the approval stage.

ORIC has been recently established at KIET, which has been officially recognized by HEC on 7th October 2021. The director ORIC is actively engaged with the local industry. Few MoUs have also been signed. ORIC has formulated a policy regarding consultancy work.

# . Criterion 6 – Facilities and Infrastructure

## Buildings

* The Main Campus area is 11 acres extendable to 22 acres at PAF Base

Korangi Creek.

* Total covered area of the Institute for administration and academic purposes:120,339 sq. ft.
* College of Engineering has an exclusive and purpose-built structure.
* The building construction plan caters for the future needs in three phases.
* The College building has exclusive and dedicated Lecture Halls, Classrooms, Labs and offices for the faculty and academic support staff.

|  |  |  |  |
| --- | --- | --- | --- |
| **Building Facility** | **Area** (Sq Ft) | **Dedicated** | **Shared** |
| Lecture Halls | 1872 | 1 | 2 |
| Classrooms | 4000 | 3 | 2 |
| Auditorium | 1386 | - | 1 |
| Library | 3000 | 1 | 1 |
| Sensors & Actuators Lab | 936 | 1 | - |
| Senior Design Project Lab / Mechatronics System Design Lab | 601 | 1 | - |
| Fluid Mechanics Lab | 624 | 1 | - |
| Fundamentals of Thermal Sciences Lab | 624 | 1 | - |
| Robotics Lab | 624 | 1 | - |
| General Engineering Workshop | 1994 | 1 | - |
| Instrumentation & Data Acquisition Lab | 624 | - | 1 |
| Electrical Machine Lab / Power Electronics Lab | 637 | - | 1 |
| Computation & Design Lab | 936 | - | 1 |

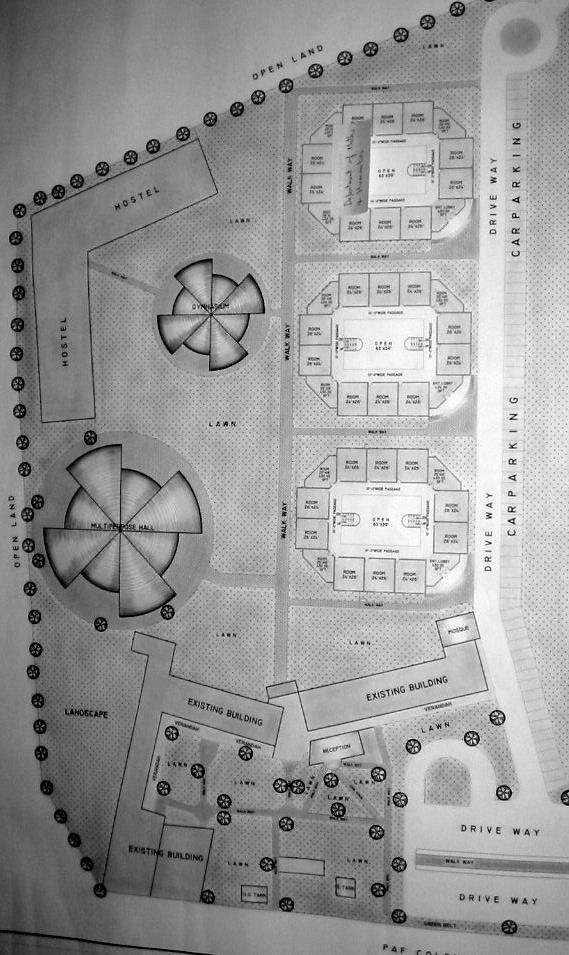
|  |  |  |  |
| --- | --- | --- | --- |
| Microprocessors & Interfacing Lab / Digital Systems Lab | 1263 | - | 1 |
| Electronics Lab | 936 | - | 1 |
| Industrial Automation Lab | 936 | - | 1 |
| Computation & Design Lab II | 637 | - | 1 |
| Basic Electrical Engineering Lab | 437 | - | 1 |
| Communication Lab | 624 | - | 1 |
| Propulsion & Avionics System Simulation Lab | 660 | - | 1 |
| Flight Control System Lab / Radar Systems Engineering Lab | 598 | - | 1 |
| Avionics System Design Lab | 598 | - | 1 |
| Microwave & Antenna Lab | 490 | - | 1 |
| Telecom Transmission & Switching Lab | 410 | - | 1 |
| Advance Electronics Lab | 624 | - | 1 |
| Modeling & Simulation Lab | 600 | - | 1 |
| Linux Lab | 900 | - | 1 |
| General Computer Labs | 1440 | - | 2 |
| Cafeteria & Tuck Shop | 1240 | - | 1 |
| Offices | 916 | 1 | 6 |
| New Offices / Faculty Room | 330 | 1 | 3 |
| Advance Research Center | 858 | - | 1 |
| Ladies Lounge | 312 | - | 1 |
| Syndicate Room & Faculty Lounge | 624 | - | 1 |
| Gym. & Sports Center | 5000 | - | 1 |

The other building facilities available to engineering program include:

* **General Engineering Workshop:** The general engineering workshop having area 1994 sqft has been established separately.
* **Propulsion and Avionics System Simulation Lab:** The Propulsion & Avionics Systems Simulation Lab having area 660 sqft & Aircraft paved platform 1228 sq.
* **Department of Avionics Engineering:** The Department of Avionics Engineering having area 5516 sqft.

See **Annexure G1** for details about College of Engineering Labs related to the Electrical Engineering Department.

Sketch Map of College of Engineering



## Other Allied Facilities

* There are eleven computational labs that extend computational facilities to the students. These labs are equipped with over 200 computers having high-speed processors and the other peripherals to support the computational needs of students.
* The Computation and Design Facility Lab I & II (C&DL I & II) of College of Engineering has 90 PCs to accommodate the exclusive requirements of engineering students in their design and simulation work that requires the use of engineering application software such as:
  + Microsoft Office
  + MATLAB with SIMULINK
  + SOLIDWORKS
  + ELECTRONIC WORKBENCH (MULTISIM)
  + LABVIEW
  + WIRE SHARK
  + CISCO PACKET TRACER
  + CRYPTOOL
  + MICROSOFT VISUAL STUDIO
  + AUTOCAD
  + TURBO C
  + DEV C++
* The computing infrastructure consists of a Local Area Network (LAN) that:
  + Connects the academic and the administrative networks
  + Provides access to Management Information System
  + Connects Internet and Intranet services
* Internet services are high-speed having a wide band satellite link that offers excellent download capability. Powerful and dedicated servers for LAN, MIS, web applications, and e-mail, cater for academic and administration needs.
* Each faculty member has been provided with:
  + Laptop / PC
  + Printing Facility on network printer  Necessary secretarial assistance  Academic Support.
  + Internet Facility
* Accessibility of faculty/students to internet facilities and international databases
* The engineering students have access to
  + - Computer facilities General Lab: Full-Time
    - Other Computer Labs: Full Access\*
    - Computation and Design Lab (I & II): Full Access\*

(\*Except lab occupation timings for scheduled sessions)

## Library

The main library at a glance:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Books** | **Book**  **Categories** | **Journals / Magazines** | **News papers** | **Reading**  **Room**  **Capacity** | **Study**  **Cubicles** | **PCs** | **SW CDs** |
| 19124 | 123 | 40 | 5 | 115 | 24 | 24 | 1,000 |

|  |  |
| --- | --- |
|  Engineering: | 2037 |
|  Engineering total no. of copies/volumes/books  Computer Sciences: | *3424*  *1744* |
|  Management Sciences: | *3105* |
|  References/Literature: | 934 |
| **Total** | **9207** |

* Journals/Magazines subscription: 22
* International Magazines: 7
* Local Magazines: 5
* Research Journals 10

* 9,000 books on different subjects as text and reference books and light reading.
* Substantial quantity of text and reference library material available on CDs The library maintains books in the following major categories:

|  |  |
| --- | --- |
|  Engineering |  Mathematics |
|  Computer Sciences |  English |
|  Management Sciences |  Leadership |
|  Marketing | Social Sciences |
|  Accounting |  Philosophy |
|  Economics |  Fiction |
|  Humanities |  References |

Library subscribes to 26 journals/magazines on a variety of topics that includes:

|  |  |
| --- | --- |
|  Engineering |  Management |
|  Economics |  Computers |
|  Communications |  Information Technology |

|  |  |
| --- | --- |
|  Business |  Business |
|  Software |  Others |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Library Information Related to Engineering** | | | | | |  | |
| **S.No** | **Books** | | | | **Books Procured** | | **Budget** | |
|  | **Reference** | **Circulation** | **\*Magazines** | **\*Journals** | **Last**    **Year** | **Current**  **Year**  **(Jan to Mar)** | **Last**  **Year**  **(Rs)** | **Current**  **Year**  **(Rs)** |
| **1** | 934 | **3424** | **07** | 10 | 10 | 78 | **6.0M** | **6.0 M** |

Details of Engineering Book titles are given in **Annexure-O**.

Library has:

* Up-to-date record of all relevant government publications
* Extensive archive of newspapers
* Link with world resources through high-speed internet connectivity
* Dedicated radio link for inter-campus connectivity
* Access to national & international e-journals for research requirements  Subscription of digital libraries of professional forums like IEEE and ACM.
* Access to all digital libraries extended by HEC to universities / institutes **(Annexure-P)**

Library is in the process of acquiring a link to ultra-fast internet connectivity

## Department Library

Besides main library, there exists a departmental library to meet the exclusive requirements of the faculty and students of the College of Engineering. The Departmental Library has collection of library material to cater for the design and development requirements of:

* Electronics  Digital Systems
* Instrumentation & Measurement  Automation & Robotics
* Telecommunications  Other related areas

The library material includes books and journals pertaining to engineering in general and electronics engineering in particular. The departmental library besides having various volumes of reference books also has a number of:

|  |  |
| --- | --- |
| * Handbooks * Design Manuals * Data Sheets | * Design Guides * Design Specification Books * Lab Manuals |

The departmental library has the following equipment for student/faculty seminars, workshops, and presentations:

* PCs for computerized search
* Printer / Scanner
* Audio/Visual Aids
* Engineering Application Software CDs
* Design CDs
* Multimedia Projector

The Departmental library also holds:

* Research Journals
* Conference Proceedings
* Project Reports

The Departmental library has connection to both internet and intranet. The high-speed connectivity provides quick access to local and international information agencies.

### Budget

The Institute allocates funds for the purchase of books, journals, and other R & D publications on annual basis @ Rs 1500/- per student per year. The library budget for the current year is Rs 2.0 Million.

### Books

The library is equipped with books on variety of fields. The department wise details of library books are as follows:

|  |  |
| --- | --- |
|  Engineering: | 3888 |
|  Computer Sciences: | 4249 |
|  Management Sciences: | 9566 |
|  References/Literature: | 817 |
| **Total** | **18,520** |

**Details of Engineering Book titles are given in Annexure-O.**

### Library Equipment

To facilitate students in exploring digital libraries and to exploit software resources, the institute’s library is equipped with:

* Printer (shared)
* PC's
* National Digital Library Access
* CD ROMs
* Internet connectivity

### Journals

The library subscribes to Journals/Magazines of National/ International repute.

* Journals/Magazines subscription: 32
* International Magazines: 12
* Local Magazines: 11
* Research Journals 09

Access to a large number of on-line journals and research publications is also available through digital libraries extended by HEC and through library’s own subscriptions.

**Annexures O** and **P** list of subscribed Journals/Magazines and details of digital libraries.

## Annual Cost Per Student

|  |  |
| --- | --- |
| Program CrHrs | 146 |
| Program Duration | 4 Years |
| Cost per CrHr | Rs. 5,600 |
| Program Cost | 825,400 |

|  |  |
| --- | --- |
| Cost per Student per year | Rs. 209,150 |

## Financial Support to Students

Besides specified scholarships based on academic performance, financial assistance in the form of various discounts is also available to students on need basis as well. Student Fee Concessions for DESERVING Students recommended by members of Board of Governors and Board of Trustees of Pakistan Educational Foundation. The following fee concessions have been authorized for the deserving students recommended by members of Board of Governors and Board of Trustees of PEF. The concession authorized shall be up to 10% of the tuition fee only. The concession to the evening program students shall also be up to 10% of the tuition fee. **Scholarships:**

Meritorious academic performance by students will be given recognition at KIET. It is hoped that such positive measures at institute level will enhance the quality of students and instill a sense of competition amongst the students. The policy is being envisaged in the light of Board of Governors meeting held on 26 Sep 2000 where it was decided that grant of free concession will be as under: -

1. 80% concession to 1% of the total enrolment in a semester
2. 40% concession to 2% of the total enrolment in a Semester
3. 20% concession to 4% of the total enrolment in a semester

**Committee of Selection:**

1. President Chairman
2. Directors of the Colleges
3. Director Registration
4. Member Academic Counsel from PAF

**Criteria of Nomination for Scholarships:**

1. All students registered in any of the program exceeding the year are eligible for scholarship
2. Min GPA of 3.5 in the last semester.
3. The grant/scholarship will be for one semester only. Fresh nomination will be made in next semester.
4. Students obtaining awards in one semester are eligible for it in the next semester also.

**Fee Concession for KIET Employees**

As per Decision of the J.C.C. held on 04 Sept 2001 the fee concession approved for KIET faculty members and staff shall be as follows:

Self: All offered courses at the Institute at 55% of the full fee (To prevent interference with normal working, no course shall be allowed during duty hours of the individual). The following conditions will apply: On acquiring of higher qualification, the employee shall not demand automatic up gradation to higher pay scale or appointment. The employee shall serve KIET for a minimum period of two years after acquiring of higher qualification.

Dependents: The immediate family members (Spouse and Children) can avail the following:

**Sibling:**

In response to parents request it has been decided by the Joint Coordination Committee of KIET that the Institute will grant 25% concession in tuition fees to such students who have been selected for admission at the Institute and have a real brother or sister at KIET who is paying full fees.

**Financial Assistance on Need Basis:**

Ehsan Trust provides educational loan (without interest) to the deserving students. The aim of Educational Loan(EL) is to help financially handicapped students.

## Class Size

Theory

The average class size for all subjects remains around 29 students.

|  |  |
| --- | --- |
| **Semesters** | **Avg. Class Strength** |
| Spring 2017 | 25 |
| Fall 2017 | 22 |
| Spring 2018 | 22 |
| Fall 2018 | 22 |
| Spring 2019 | 23 |
| Fall 2019 | 23 |
| Spring 2020 | 23 |
| Fall 2020 | 23 |
| Spring 2021 | 25 |
| Fall 2021 | 25 |

The class size average remains around 26 for engineering subjects.

### Practical

Class size of lab-based courses is 20- 40 students. The following Laboratories are available:

**Dedicated Labs**

1. Sensors & Actuators Lab
2. Senior Design Project Lab / Mechatronics System Design Lab
3. Fluid Mechanics Lab
4. Robotics Lab
5. General Engineering Workshop
6. Fundamentals of Thermal Sciences Lab

Shared Labs

7. Instrumentation & Data Acquisition Lab

8 Computation & Design Lab

1. Microprocessors & Interfacing Lab / Digital System Lab
2. Electronics Lab
3. Industrial Automation Lab
4. Basic Electrical Engineering Lab

**Note**: The Student: Workstation ratio is typically 3:1 except for computer lab where the ratio is 1:1.

## Office Hours For Academic Counseling

Each faculty member allocates office hours for the counseling of the students.

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Faculty Name** | **Days** | **Time** |
| 1 | Dr. Muhammad Bilal Kadri | Tuesday | 10:40-11:30  11:40-12:30 |
| 2 | Dr. Muzaffar Mahmood | Monday, Thursday | 10:40 to 11:30  10:40: to 11:30 |
| 3 | Saad Salim | Monday, Wednesday | 09:40 to 10:30  09:40: to 10:30 |
| 4 | Misbah ul Haq | Tuesday, Friday | 09:40 to 10:30  09:40: to 10:30 |
| 5 | Hafiz Ahsan | Tuesday, Wednesday | 10:40 to 11:30  10:40 to 11:30 |
| 6 | Muhammad Duraid | Monday, Thursday | 12:40 to 01:30  11:40: to 12:30 |
| 7 | Sofia Yousuf Sheikh | Monday, Thursday | 01:40 to 02:30  11:40: to 12:30 |
| 8 | Bushra | Monday, Thursday | 10:40 to 11:30  10:40: to 11:30 |

### Mentoring Groups

Besides academic counseling by the faculty, mentoring system has also been established. Through this forum every student is assigned a mentor who looks after all matters related to students.

The aim of the tutorial / mentoring sessions is to provide mentoring, help, guidance and big brother / sister support for the students.

The mentors assume following roles depending upon the needs of a student:

1. To monitor the academic progress of his wards.
2. Guide, support and help the weak students
3. Co-ordinate with other faculty at the Institute to provide help to the students where needed.
4. Big brother / sister role with a kind and helpful toward the wards.
5. Boosting the morale of weak students and developing a close bonding with them.

## Other Facilities For Students

### Hostel (s) Accommodation

2 acres of land has been marked for hostels. The institute plans to develop and provide hostel facilities for both male and female students at the Main Campus in Korangi Creek for 200 – 250 students with all amenities in the next 4 – 5 years.

### Convocation Hall / Auditorium

The institute has an air-conditioned, suitably illuminated, and well furnished Auditorium / Convocation Hall having a seating capacity for about 200 persons.

### Sports Facilities

The institute has provided:

* Cricket ground
* Volleyball Court
* Badminton Court
* Basketball Court
* Table Tennis
* Gymnasium
* Athletics Facility

### Student Transport

* KIET provides point-transport between the Main Campus Korangi Creek and distant areas of Karachi on affordable rates.
* Free of Cost Shuttle Servicebetween Korangi Crossing and KIET (both ways) in order to facilitate those students who do not avail regular point transports.
* Metro Bus service also ply between PAF Base Korangi Creek and Saddar (VIA Baluch Colony), which is an added facility.
* At present, 600 plus students are availing institute sponsored transport facility on regular points and free shuttle service between KIET & Korangi Crossing.
* 14 Students & 7 Faculty / Staff Coasters / Vans are plying between Karachi and KIET.

|  |  |  |
| --- | --- | --- |
| **No of Coaches** | **No of Students** | **No of Routes** |
| **21** | **400 plus** | **21** |

### Other Facilities

Students are encouraged to participate in inter-university tournaments/ competitions. Following facilities are also available:

* Well-furnished and air-conditioned Student Societies’ Office with a PC where students plan and organize their activities.
* One Air-conditioned cafeteria (capacity 70 persons)
* A Recreation/Common Room (catering female students’ needs)
* Two other cafeteria facilities (capacity 150 persons)
* Three shaded open spaces (for leisure sittings of the students)
* A Stationary Shop and Photocopying Facility
* First aid facility (arranged through Medical Officer, PAF Base Korangi Creek)
* **Faculty Lounge:** Faculty lounge having area 600 sqft with facilities for sitting, faculty committee meetings.
* **Faculty / Staff Offices:** Additional offices (area 600 sqft) for faculty and staff.
* **Ladies Lounge:** The lounge (area 600 sqft) catering for sitting, prayers and toilet needs.

# . Criterion 7 – Institutional Support and Financial Budget

## Operational Budget

The budget estimates for expenses during financial year ending June 30, 2022 are Rs 16.73 M. The details are given below:

|  |  |
| --- | --- |
| **Budget Head** | **Rupees in Million**  **(2021-22)** |
| Pay and Allowances | 11.48 |
| Utilities | 2.62 |
| Maintenance | 0.20 |
| Consumables | 0.34 |
| Other expenses (Advertising, Depreciation ,Convocation, Transportation, Financial Charges etc) | 2.09 |
| **Total** | **16.73** |

## Development Budget

The total development budget remains about 20 % of operational budget every year. The development budget share allocated exclusively for lab equipment, buildings, furnishing and air-conditioning of College of Engineering over the last five years is shown below:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Year** | **2017-18** | **2018-19** | **2019-20** | **2020-21** | **2021-22** |
| Amount  (Rs in Million) | 7.0 | 11.0 | 11.0 | 11.0 |  |

## Investment and Internal Resource Generation

### Investment

Presently the institute holds an Endowment Fund of Rs. 152.5 M.

### Internal Resource Generation

The institute has the capacity and the skills to generate resources and to extend these resources for effective and efficient working of faculty, staff and students. A few examples in this context are the development of a Management Information System and Intranet (Local Web).

* Self-generated resources -100%
* Consultancy for industry projects Rs.0.39M
* Workshops and seminars for the corporate sector Rs. 0.13M
* Sponsorships for students’ events Rs. 0.27M

## Continued Financial Commitments

### Sources:

* The institute is self-financed.
* Source of yearly income: student fees
* Endowment fund: established in June 2001
* Present worth of endowment fund: Rs. 152.5 M
* Value of immoveable assets: Rs 146.27 M
* Value of moveable assets: Rs 278.45 M

The revenue figures for the last 5 years:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Year** | **2016-17** | **2017-18** | **2018-19** | **2019-20** | **2020-21** |
| **Revenues**  (Rs in M) | 11.66 | 15.44 | 19.04 | 15.90 | 13.37 |

### Operational Budget:

Estimated budget for FY 2018-19 and FY 2019-20: Rs 15.29 M and Rs. 17.58 M.

|  |  |
| --- | --- |
| **Budget Head** | **Rupees in Million** |
| Pay and Allowances | 11.48 |
| Utilities | 2.62 |
| Maintenance | 0.20 |
| Consumables | 0.34 |
| Other expenses (Advertising, Depreciation, Convocation, Transportation, Financial Charges etc.) | 2.09 |
| **Total** | **16.73** |

### Development Budget:

Out of the total development budget, allocation for labs, furnishing and air-conditioning of College of Engineering is Rs. 11 M.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Year** | **2016-17** | **2017-18** | **2018-19** | **2019-20** | **2020-21** |
| (Rs in Million) |  | 1.0 | 3.0 | 3.0 | 3.0 |

### Investments:

Endowment Fund holding: Rs. 152.5 M.

Operational and Development Budget of the Electrical Engineering Department is attached at Annexure L.

# . Criterion 8 – Continual Quality Improvement

## Continuous Quality Improvement Process

Continuous quality improvement is the part of the overall objective evaluation process. The process consists of three concentric cycles. These cycles are related to PEOs, PLOs and CLOs. Each cycle has CQI as its integral part. The process of defining of PEOs, PLOs and CLOs has already been established. The evaluation process of the three types of objectives and their measurements by direct and indirect methods is also defined. The CQI process takes place at various academic levels and the analysis of the achievement of each objective against predefined minimum attainment levels is carried out.

### CQI Framework

|  |  |  |
| --- | --- | --- |
| **S#** | **Statutory Body** | **Responsible for CQI at** |
| 1. | Board of Studies | Course Learning Outcomes (CLO) and Program Learning Outcomes (PLO) |
| 2. | Engineering Curriculum Advisory Board | Program Education Objectives (PEO level) |
| 3. | Academic Council Meeting | Revision or Approval of PEOs or PLOs |

|  |  |  |
| --- | --- | --- |
| **Survey** | **CQI for** | **Data Collection Rate** |
| Alumni Survey | PEO | Annually |
| Employer Survey | PEO | Annually |
| Graduating Students Survey | PLO | Annually |
| Internship Survey | PLO | Annually |
| Instructor Course Feedback form | PLO | At end of semester |
| PLO Attainment | PLO | At end of semester |
| CLO Attainment | CLO | At end of semester |

### Review of PEOs and PLOs

Review of PEOs and PLOs is linked with the review of curriculum by the Engineering Curriculum Advisory Board. If a need to revise the curriculum arises, the PEOs and PLOs will also be reviewed and revised if necessary. The curriculum may be reviewed on the basis of new regulatory requirements, alumni feedback, employer feedback, etc.

### Review of PEOs and PLOs

Additional quizzes and assignments were taken wherever required for lagging students, teachers and senior faculty provided counselling to weak students. A new proforma was used in cause folders to monitor progress of students and impact of corrective measures. Several sessions of board of studies were held to assess individual and cohort level CLOs and PLOs. Counselling sessions for students with low PLO attainment were scheduled and organized and remarks from concerned faculty/HoD and remedial measures were recorded on a newly developed Performa. Samples of additional quiz and monitoring Performa are shown below.

## Compliance/Actions Taken by Department since Last PEC Visit

1. **The department has defined their own Vision in addition to the Mission statement. It is recommended that they should have Mission Statement only and duly aligned with the HEI’s Vision. Also, the Mission statement of the department is published at the HEI’s website only. The visitation team did not find the department’s mission published anywhere else, such as classrooms and labs.**

The department's mission was defined with the recommendation and approval of the Academic Council. The issue will be further discussed in the forthcoming Board of Studies and the Board of Faculty meeting. The final recommendation from the Academic Council will be implemented in due course of time. The Mission statement is also published in the prospectus, efforts will be made to make it available in all classrooms and labs.

1. **The visitation found that the stakeholders have not been defined and involved in the   
   formulation of the PEOs. However, a mechanism has been defined for the revision of the PEOs, which has not been practiced yet.**

Stakeholders have been involved in the formulation of the PEOs. The PEOs  
 were formulated in 2019 and were thoroughly discussed by senior academicians and members of the industry. Scanned Minutes of the Meeting are attached. PEO revision will be held after 05 years. Since our first OBE accreditated batch graduated in 2019, PEOs revision cycle will be invoked in 2024 in sha Allah.

1. **Teaching – learning assessments are not appropriate for the attainment of the PLOs. Many of the course folders audited during the visit reflect that the students have been asked to state simple facts and the assessment has been linked to PLO-2 or 3. Similar situation was observed with Lab, where the faculty and staff and the lab engineers were not sure how and when they shall be assessing the students’ performance in the Psychomotor domain. The Labs have single generic list of 7 CLOs. Where a CLO requires the analysis of data, it has been included into the Psychomotor domain.**

We would like to highlight that many of the courses and their assessment tools are designed at the appropriate level. As evidence midterm, final exam and complex engineering problems of the following courses are attached:  
  
1) Linear Control System  
2) Industrial Control and Automation  
3) Electronic Circuit Design  
4) Robotics   
5) Sensors and Actuators  
  
where simple facts are not linked to PLO2 and PLO3. Similarly in the labs , according to a university-wide decision all labs had 07 CLOs, the list is not generic. CLO2, CLO3 and CLO4 are specif to the lab whereas CLO5 relates to the Open-ended lab (which is conducted as a lab project). CLO6 is for the teamwork and CLO7 relates to safety. As a proof, lab outlines of the following courses, with detailed mapping is also attached.  
  
1) Fluid Mechanics  
2) Fundamental of Thermal Sciences  
3) Industrial Control and Automation  
4) Mechatronics System Design  
5 )Robotics  
6) Sensors and Actuators  
  
There was a lot of effort put in by the department to define the rubrics of each lab .   
  
Since the PEVs had strong background in Mechanical Engineering and the focus of the Mechatronics Department is more towards Robotics and Automation, hence many facets of our achievements were downplayed as evidenced in the complete report .Nevertheless as recommended by the PEVs, the assessment tools e.g. the quiz, midterm and final exam will be reviewed.

1. **The assessment data is being collected, but no further analysis/mechanism for improvement is being carried out.**

A complete process is in place to refine the system. CLO Cohort bar graphs, as well as the class performance histogram, are generated for each course at the end of every semester. The analysis is conducted at the end of every semester in the End Term Review meeting, chaired by the HoD. Complete Minutes of the meetings are maintained.

1. **Shallow coverage of the design aspects. Where the depth of knowledge is required, the assessments are too simple to mean it. Curriculum need to be revised for improvement. Eight semester contains two humanities courses (Pakistan & Islamic Studies and English), one management and one mathematics course; that are too rudimentary for 8th semester teaching.**

The Mechatronics department curriculum is in line with the HEC ECRDC curriculum. A comparison matrix of the mechatronics curriculum with HEC is attached as evidence. The curriculum was revised in June 2021 with the recommendations of senior members from the academia and the industry. The MoM are attached. It is quite disappointing that many of the documentary proofs provided to the visitation team were not consulted before preparing the report. There isn't one mathematics course as reported by PEVs, on the contrary there are six maths courses, six (06) humanities courses and two (02) management science course. The prospectus is attached as evidence. List of courses are:  
  
Humanities  
\_\_\_\_\_\_\_\_\_  
English (Public Speaking)   
English ( Official Communication and Report Writing)   
Islam and Pakistan Studies   
Professional and Social Ethics   
Leadership and Motivation   
Community Service   
  
Management Sciences  
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
Engineering Project Management   
Technology Entrepreneurship  
  
Math  
\_\_\_   
Calculus   
Linear Algebra   
Differential Equations and Transforms   
Complex Variables and Multivariable Calculus   
Numerical Methods

1. **The faculty has no understanding of the CEP, or its attributes or how it relates to the knowledge profiles. Those problems that were presented to the visitation team as sample CEPs were too simple and well-defined problems. The evidence reviewed during the visit suggest that the faculty consider CEPs to be well defined difficult problems. They were not sure what should be the lowest cognition level of the CEPs**

HoD as well as the faculty was trained by an OBE expert recommended by PEC. CEPs of many courses have been designed very meticulously. CEPs of Linear Control System and Industrial Control and Automation courses are attached as evidence. The CEPs are specifically designed by the faculty members keeping in view the depth of analysis and knowledge required to solve the complex problem.

1. **Most of the labs are in place, some are deficient in equipment or numbers of workstations to meet student demands. The labs, such Mechanical Workshop is very congested hindering the students’ movement while performing in the lab.**

List of equipment in each lab is attached. Based on the low intake for the past few batches, the lab equipment is sufficient to meet student needs. Research project titled "4DOF Motion Platform" funded by NCRA is in the design phase. The complete platform is in the fabrication phase and is being built in the Engineering Workshop. This project was is causing congestion in the Engineering Workshop. The project will be moved to the research lab in a months time.

1. **CLOs have been defined for most of the courses, but some of the subjects such as HS 2304, Public Speaking does not have any CLOs defined. In many instances, the design of assessment do not match with the taxonomy level targeted. Very simple numerical problems were given to assess those CLOs that were framed at C4 or C5 level.**

HS2304 Public Speaking has CLOs defined, proof is attached. As stated earlier the PEVs did not consult the documents provided to them, hence many things contrary to the facts have been reported.

1. **The FYDP are too simple, and do not qualify to be regarded as a culmination of a CEP and the faculty does not know much about the SDGs and hence their mapping with the SDGs**

In the past three years due to the high quality and competitive nature of the undergraduate projects, eight (08) FYDPs from the Mechatronics department have been funded by the prestigious National Grassroot Research Initiative (NGIRI), IGNITE, Pakistan. Few outstanding FYDPs are listed below:  
a) One FYDP in batch SP18 related to autonomous quadcopter was shortlisted by TUBITAK UAV International Competition.   
b) SP16 students designed a smart convertible wheelchair as FYDP. They have received industrial funding and are currently incubated in KIET’s Technology Incubation Centre.   
c) A group of three students from SP18 have locally designed and manufactured a fixed-wing plane, that will be ultimately used in the PAF project.  
  
Since the PEVs had strong background in Mechanical Engineering and the focus of the Mechatronics Department is more towards Robotics and Automation, hence many facets of our achievements were downplayed as evidenced in the complete report. Few selected FYDP of the graduating batch are listed below:  
  
1) Navigation of Customized, ROS-based Autonomous Quadcopter using ORB SLAM with Nvidia Jetson & Stereo Image Processing / LiDAR Waypoint Tracking  
2) Flight Dynamic Model of C-130 Aircraft  
3) Design and fabrication of Skywalker Fixed Wing UAV (funded by PAF)  
4) Design and Ddevelopment of autonomous bomm disposal robot   
5) Three Dimensional (3D) Printer Using Arduino 9 Mega  
6) AUTOMATIC WALL PAINTING ROBOT  
7) Robotic Arm with 5 degrees of freedom   
8) Self Controlled Floor Cleaning and Mopping Robot  
9) STAIR CLIMBING WHEELCHAIR   
10) Laser cutter and engraver  
11) IOT CONTROLLED 3 PHASE MONITORING SYSTEM  
  
   
  
FYDPs of the graduating batch have been mapped on the SDGs, the mapping is attached. A training session of the faculty members regarding the SDGs will be conducted soon.

1. **The FYDP governance and evaluation mechanism does exist, but it is not formalized in the form of SOPs. The process needs more rigorous supervision and assessment mechanism throughout the FYDP cycle.**

Complete SOPs exist for the conduct of Senior Design Projects (SDP) or FYDP. As highlighted earlier most of the evidence provided to the visitation team was not thoroughly consulted. A uniform SDP policy exists for all engineering departments. SDP forms and evaluation process is done very rigorously. All SDP evaluation forms as well as the policy is attached. Due to the extremely high quality of our FYDP, in the current batch i.e. SP18, 05 projects have been funded by NIGRI IGNITE.

1. **Quality of process to evaluate student performance and suggest / take corrective measures. Process outlined, but never followed**

OBE based student counselling is held at the end of every semester. PLO attainment reports of all the students are generated at the end of every semester. Any student who attains below 40% in any of the PLO is invited for a "Student Faculty Board" i.e. Student Counselling session. PLO attainment report as well as the email from the faculty member after conducting the counselling session is attached.

1. **Effectiveness of faculty development program to ensure their professional growth and retention. No Faculty development program exists**

Faculty is motivated to pursue higher education from KIET as well as from any other HEI. Faculty is given 55% concession in fees if they are enrolled in MS/PhD program at KIET. Policy document is attached (please refer to page 15). One faculty member (Sofia Yousuf) is currently enrolled in PhD program at KIET. One lab engineer (Mr. Tehreem ) is also currently enrolled in the MS program. Hamza (the second lab engineer) is pursuing his MS studies from NED University.

1. **Course files though maintained but need thorough improvement as following: • Folders lack essential information, such as the copies of the best, average, and worst work done by the students. • In some folders theory and lab course materials are merged, though the theory and lab courses are separate. • Some information such as time-table and course completion and course analysis reports are missing. • In Assignments, Quizzes and CEP question papers the questions are not linked to the relevant CLOs/PLOs. • Corrective measures for given course for failed KPIs of students are not included. • No description of Lab projects in lab folders is provided.**

All the course folders contain best average and worst work done by the student. All theory and lab folders are separate. Course analysis report are generated by LMS for all course which is attached in every course folder. In all quizzes, exams the questions are properly linked with relevant CLOs. Evidence of corrective measures is included in every course folder. Most of the labs have a complete description. As a sample course folder material for Power Electronics course is attached. Due to the limitation of file size (i.e. 25MB), other course folder material cannot be uploaded, however complete evidence is available in house.

1. **The department has six dedicated labs with limited number of equipment/workstations. All other labs are shared with EE department. The department should establish its own Control lab, Computer Lab, Drawing Lab and Electrical Circuit Lab. The Robotics lab has very few pieces of equipment, hindering the opportunity for sufficient hands-on experience**

The six dedicated Mechatronics department labs are 1) Thermodynamics Lab 2) Fluid Mechanics Lab 3) Engineering Workshop 4) Robotics Lab 5) Mechatronics System Design Lab and 6) Sensors Actuators & Control Engineering Lab. Sufficient number of equipment exist in the dedicated labs for the successful conduct of the experiments. A list of equipment in the 06 dedicated labs (as well as shared labs) with complete details is attached. Lab equipment that is common to both Sensor & Actuators Lab and Control Engineering Lab is housed in one spacious lab. If the lab is segregated into two sub labs, it will create problems for the lab staff as well as for the students.   
  
Few electrical engineering labs such as Electronic Circuit Lab, Microprocessor Lab, Electrical Machines Lab and Computer Lab are shared, which have sufficient capacity and equipment for the conduction of labs. All these labs are currently underutilized due to the low intake of students in Electrical Engineering as well as the Mechatronics department.   
  
Based on the convener’s recommendations during the previous PEC accreditation visit, a lecture theatre having a capacity for more than 50 students was converted into a shared drawing hall. Forty (40) drawing boards were specifically designed and manufactured. Engineering Drawing Lab of (02) credit hours i.e. 06 contact hours has been successfully conducted for the past 03 years. Images from the lecture theatre cum drawing hall is also attached as a proof.   
  
The Robotics Lab has eight (08) robotic arms, sixteen (16) ZUMO mobile robots, nine (09) LEGO Robot Kits, eight (08) desktop computers, eight (08) function generators, eight (08) power supplies and eight (08) digital oscilloscopes. (Images are attached). The visitation team was quite impressed with the setup, on the contrary, they have reported a bleak picture of the department which is deplorable.

1. **Limited research publications / R&D / consultancy activities**

Dr. Muhammad Bilal Kadri (HOD Mechatronics) is actively involved within industrial research projects. A research grant worth 14.6 million PKR was awarded by IGNITE, Pakistan for the design and development of firefighting robots. The robots were designed with the recommendation and consultation of the Karachi Metropolitan Corporation (KMC). Dr Kadri along with Lecturer Sofia is working on a classified research project with the Pakistan Air force (PAF). The research grant is worth 2.9 million PKR. Dr Adil Loya (who served in the Mechatronics department for more than four years and has recently left) was involved in another industrial project related to the simulation of C-130 aircraft. The HoD along with the Mechatronics faculty members have submitted a research project in NCRA, the industrial collaborator was Data Communications and Controls (DCC), Karachi. A research project related to accurate controlling and delivering goods using drones have been submitted to NCGSA. The industrial partner is DataLog, Karachi. The project is in the approval stage. ORIC has been recently established at KIET, which has been officially recognized by HEC on 7th October 2021. The director ORIC is actively engaged with the local industry. Few MoUs have also been signed. ORIC has formulated a policy regarding consultancy work.

# . Criterion 9 – Industrial Linkages

## Active Engineering Curriculum Advisory Board with Industry Input

The Engineering Curriculum Advisory Board exists to remain abreast with the requirements of local industry. The aim of Engineering Curriculum Advisory Board is to take industry input in the process of curriculum development. Its functions are equivalent to that of Industrial Advisory Board in the OBE system. The Board acts as a bridge between industry and academia. Engineering Curriculum Advisory Board consists of:

* Dean Academics – Chairman
* Director College (s)
* HODs
* Distinguished Professors from Academia
* Eminent Professionals from industry

**Composition of Engineering Curriculum Advisory Board**

The following members approved the syllabus for the program in consideration:

|  |  |  |
| --- | --- | --- |
| Dr. Ali Raza Jafri | Professor & Chairman Biomedical Engg Department, NED University LEJ Campus | Academia |
| Dr. Muhammad Mohsin Aman | NEDUET | Academia |
| Mr. Fawad Qureshi | Industry Consultant | Industry |
| Mr Humayun Qureshi | Industry Consultant | Industry |
| Mr. Javed Gul | School of Aeronautics, PAF | Academia |
| Mr. Harris | School of Aeronautics, PAF | Academia |
| Prof. Dr. Muzzaffar Mahmood | Dean Academics, KIET | Academia |
| Prof. Dr. Imran Naseem | Head of Curriculum, KIET | Academia |
| Prof. Dr. M. Bilal Kadri | HoD Mechatronics | Academia |
| Prof. Dr. Arsalan Jawaid | HoD Mechatronics | Academia |
| Assoc. Prof. Dr. Sameer Hashmat | HoD Electrical | Academia |
| Astt. Prof. Najeeb Jaffri | KIET | Academia |
| Astt. Prof. Muhammad Ejaz Tayyab | Secretary ECAC, KIET | Academia |

## Industrial Experience for Students as mandatory Internships

Internship is mandatory to fulfill the degree requirements of all programs offered at KIET. The internship program of the institute offers to students a real-life experience of a professional industry environment through Industry – Academia Interaction.

Student internships are an integral part of the curriculum that provides exposure to the students in reputable local and multinational organizations. Internships allow the students to experience the corporate environment from close quarters and prepare for the job requirements

Students must meet the internship requirements and submit a report approved by the organization to be eligible for the award of degrees.

In view of the high expectations of the industry regarding English communication skills on the interns, students must pass an English proficiency test to become eligible for internship placement.

See table below for the details of organizations providing internships.

ORGANIZATIONS OFFERING INTERNSHIPS

|  |  |  |  |
| --- | --- | --- | --- |
| **S.NO** | **Organization Name** | **S.NO** | **Organization Name** |
| 1 | 3A Corporation | 64 | National Engineers Pvt. Ltd. |
| 2 | A. Saadat & Co. | 65 | National Refinery Limited (NRL) |
| 3 | ABGURT (Private) Limited | 66 | National Telcom. Corp. (NTC) |
| 4 | Absolute Solutions | 67 | New Allied Electronics Indust. (Pvt) Ltd (LG) |
| 5 | AEROCAR | 68 | Nokia Siemens Networks Pakistan (Pvt.) Ltd. |
| 6 | Afroze | 69 | KIET |
| 7 | Afroze Textile Industries (Private) Limited | 70 | Pak Arab Refinery Limited (PARCO) |
| 8 | Agha Khan Hospital | 71 | Pak Arab Refinery Ltd. |
| 9 | Al Agrass Trading & Contracting | 72 | Pakistan Steel Mills |
| 10 | All Star Technology (AST) | 73 | Pak. Telecom. Com. Ltd. (PTCL) |
| 11 | AMZ Technologies | 74 | Pakistan Airconditioning & Refrigeration Corporation Ltd. |
| 12 | Apollo Telecom Pvt. Ltd. | 75 | Pakistan International Airlines Corp. (PIAC) |
| 13 | Awaz Television Network Pvt. Ltd. | 76 | Pakistan National Shipping Corporation (PNSC) |
| 14 | BHP Billiton Petroleum (Pak) Pty Ltd | 77 | Pakistan Petroleum Ltd. |
| 15 | Byco | 78 | Pakistan Railways |
| 16 | Captain Poultry Complex Pvt. Ltd. | 79 | Pakistan Refinery Limited (PRL) |
| 17 | Civil Aviation Authority of Pakistan | 80 | Pakistan Telecommunication Company Ltd. |
| 18 | Coastal Refinery Ltd. | 81 | Pakistan Council of Scientific & Industrial Research Laboratory |
| 19 | Creative Dynamics Engineering | 82 | Philips Electrical Industries Pakistan Limited |
| 20 | Cyber Internet Services Pvt. Ltd. | 83 | Phoenix |
| 21 | Dalda Foods | 84 | Pakistan Machine Tool Factory |
| 22 | Dancom Online Services Pvt Ltd | 85 | POF Wah Cantt |

|  |  |  |  |
| --- | --- | --- | --- |
| 23 | Digitec Systems | 86 | PowerGates Pakistan (Private) Limited |
| 24 | Dolphin Financial Services | 87 | Precision Technology (Private) Limited |
| 25 | DP world Karachi | 88 | Prime Fibers International |
| 26 | Eckova Technologies | 89 | Professionals' Institute of Excellence |
| 27 | Egyptian Pakistani Telecommunication Services Company Ltd. | 90 | PSQCA |
| 28 | E-Lab | 91 | Pakistan Television Corporation |
| 29 | Elahi Electronics | 92 | PWD |
| 30 | Enar Petrotech Services Pvt. Ltd. | 93 | Quetex International (WINDA) |
| 31 | Engro Asahi Polymer & Chemical | 94 | R. S. International Pvt. Ltd. |
| 32 | Era Automation | 95 | Recorder Television Network (AAJ-TV) |
| 33 | Ericsson Pakistan (Private) Limited | 96 | Rehmat Taj Enterprises |
| 34 | Fauji Fertilizer Bin Qasim Ltd. | 97 | Relacom Pakistan Pvt. Ltd |
| 35 | Faysal bank Ltd. | 98 | RIMS Technologies |
| 36 | Future Eye Incorporated | 99 | Rupafil Limited |
| 37 | General Printing Works | 100 | School of Army Air Defense |
| 38 | GEO Television Network | 101 | Shabbir Tiles |
| 39 | GlaxoSmithKline | 102 | SIEMENS Pakistan Engineering Co. Ltd. |
| 40 | Group 4 Securicor | 103 | SITA Pakistan |
| 41 | HOTSOL | 104 | Smart Technologies |
| 42 | Huawei Technologies Pakistan Pvt. Ltd. | 105 | Soft Computer Consultants |
| 43 | Hussaini Weaving (Private) Limited | 106 | Sui Southern Gas Company Ltd. |
| 44 | IBM Pakistan | 107 | Supernet Limited |
| 45 | Innovative Engineers Inc. | 108 | Symbia (Private) Limited |
| 46 | International Contact Learning (Pvt) Ltd. (ICL) | 109 | Systek Pvt. Ltd. |
| 47 | K.K Aviation | 110 | Tapal Energy (Private) Limited |
| 48 | Kaira Technologies Pvt. Ltd. | 111 | TEKNOAIDS |
| 49 | KAMRA | 112 | TeknoAids (Private) Limited (PowerGates) |
| 50 | Karachi Electric Supply Company Ltd. | 113 | Teknoaids (Pvt) Ltd PowerGates |
| 51 | Karachi Port Trust | 114 | Thal Engineering Korangi karachi |
| 52 | K-Electric | 115 | The Automators Pvt. Ltd. |
| 53 | Kidney Centre | 116 | The Right Connection Pvt. Ltd. |
| 54 | LEHR | 117 | THK Solutions |
| 55 | MANTRUST | 118 | Turbo Machine |
| 56 | MECHATRONIX | 119 | Tuwairqi Steel Mills Ltd. |
| 57 | Micropak (Private) Limited | 120 | ufone Pakistan |
| 58 | Microsystems Pvt. Ltd. | 121 | WAPDA |
| 59 | Mobilink GSM | 122 | Warid Telecom Pvt. Ltd. |
| 60 | Mobility Pakistan Ltd. | 123 | WaveComm Consultants |
| 61 | Motorolla | 124 | Worldcall Telecom Ltd. |
| 62 | MULTINET Pakistan (Private) Limited | 125 | Yunus Textile Mills |
| 63 | Zhongxing Telecom Pakistan (Pvt) Limited (ZTE) | 126 | ZONG Pakistan |

## Placement Bureau

The department of Corporate Services and Industrial Liaison besides providing internships, arranging industrial visits, getting industrial projects, and extending support for Guest Speaker sessions also facilitates engineering students in placement in the industry after their graduation.

## Industrial Linkage

To provide professional education and to contribute to the development of the industry and economy, KIET has launched several programs for strengthening industry-academia interactions. The objective of these programs is to channel the feedback from the industry into:

* Curriculum Development
* Faculty Development
* Research and Development (R & D)

Various Industry – Academia linkage arrangements that exist include:

* Internship programs with industrial organizations
* Guest speaker sessions by industry professionals
* Industrial projects
* Industrial visits
* Consultancy

KIET has industrial linkage with various industries and companies. More than 50% final year projects are industrial based. College of Engineering has received the following projects from ICT R&D Fund.

## Funded Projects

### First Project

**Project Title:** *Indigenous Development of the Flight dynamic model of Aircraft for Full flight Simulation,*

Funding Organization: PAF - Fund

Principle Investigator: Dr. Adil Loya

Budget: 3.0 million PKR

Duration: 18 months

Start Date: October 2018

Team Size: 3

### Second Project

**Project Title:**

*Design and development of Intelligent Mobile Robots (IMRs) for disaster mitigation and firefighting*

Funding Organization: ICTR&D Fund

Principle Investigator: Dr. Muhammad Bilal Kadri

Co-Principle Investigator: Dr. Tariq Mairaj (NUST-PNEC)

Budget: 14.67 million PKR

Duration: 24 months

Start Date: April 2016

Team Size: 13

### Third Project

**Project Title:**

*Design and development of Swarm of Aerial Robots for Large Industrial Inspection*

Funding Organization: HEC Pakistan HEC Turkey

Principle Investigator: Dr. Muhammad Bilal Kadri

Co-Principle Investigator: Dr. Murat Efe

Budget: 1 million PKR

Duration: 24 months

Start Date: January 2020

Team Size: 10

**Completion Date: Proposal under review**

### fourth Project

**Project Title:**

*A project of PAF on UAV localization.*

Funding Organization: PAF

Principle Investigator: Dr. Muhammad Bilal Kadri

Budget: 2.9 million PKR

Duration: 12 months

Start Date: 25 January 2021

Team Size: 4

## Mechanism

KIET encourages its faculty members in COE to provide consultancy and economical and viable solutions to the local industry by exploiting indigenous resources. Faculty members are also encouraged to contribute in industrial research and the university extends its infrastructures and other allied facilities to execute such activities. A usual mechanism is 80:20 percent shares for the faculty and the University respectively.

## Technology Innovation Center

In addition to above-mentioned arrangements, a Technology Innovation Center has been established for further promoting industry-academia interaction. The main objectives of

Technology Innovation Center are:

* Bring industry relevance in Senior Design Projects and other research projects
* Coordination with industry to ensure that projects fulfill requirements
* Facilitate students in fulfilling industry requirements for R & D projects
* Encourage industry to sponsor senior design projects for the final year students
* To provide innovative solutions to complex technological problems facing industry

The consultancy services available in Technology Innovation Center help students in:

* Identifying industry organizations for students’ Senior Design Project
* Coordinating with the industry in obtaining firm commitments
* Obtaining industry requirements from organizations for the basis of student projects and determining an achievable scope
* Facilitating professional guidance from the organizations
* Resolving any industry/organizational impediments and any procedural issues of KIET in the progress of industry projects.

## Industrial Liaison Office

A well-organized department entitled Corporate Services and Industrial Liaison is in place with proper staff and supporting mechanism. This department has been established for promotion of industry academia interaction. The department of Corporate Services and Industrial Liaison maintains an active and effective linkage with the industry and corporate sector. The nature of linkages includes sponsored research**,** initiating joint research projects, conducting short courses, organizing conferences and seminars, sharing R&D facilities, providing internships, arranging industrial visits, extending support for Guest Speaker sessions, facilitating engineering students (after graduation) in their placement in the industry. Engr. Humayun Qureshi is working as Industrial Projects Consultant to create an effective University – Industry interaction.

The Corporate Services and Industrial Liaison department also helps students in getting industrial projects. For details of some of the NGIRI sponsored projects in-hand:

|  |  |  |
| --- | --- | --- |
| **S.No** | **Project Title** | **Industry/Company** |
| 1 | Design and Fabrication Of  Anthropomorphic Robotic  Elegant System Operated with Notable  Assistance Aresona | KIET  (CoE Faculty Assigned  Project) |
| 2 | Thermal Design Of A Turbine For A 2.5  Kva Organic Rankine  Cycle System | KIET  (CoE Faculty Assigned  Project) |
| 3 | Force Feedback Sidestick for A Training Simulator | KIET  (CoE Faculty Assigned  Project) |
| 4 | Pattern Forming Robots Using Swarm Intelligence | KIET  (CoE Faculty Assigned  Project) |
| 5 | Auto Balancing Human Carrier | KIET  (CoE Faculty Assigned  Project) |
| 6 | Microcontroller Based Design and Fabrication of Humanoid Robot. | KIET  (CoE Faculty Assigned  Project) |
| 7 | Thermal and Hydraulic Design of an Evaporator and Condenser for a 2.5 kVA Organic Rankine Cycle | KIET  (CoE Faculty Assigned  Project) |
| 8 | Simultaneous Localisation and  Mapping with Kinect using Robot | KIET  (CoE Faculty Assigned  Project) |
|  | Operating System and Adaptive  Monte Carlo Localizaion Algorithm. |  |
| 9 | Design Autonomous Flight Controller in HIL Mode | KIET  (CoE Faculty Assigned  Project) |
| 10 | ROS - Based Multiagent Shape Forming UGVs | KIET  (CoE Faculty Assigned  Project) |
| 11 | Design of 3D Printer for Fabrication of Object Using Soft Polymer Layer by Layer Technique. | KIET  (CoE Faculty Assigned  Project) |
| 12 | Design and Fabrication of  Autonomous Robotic System  Operated with Notable Assistance. | KIET  (CoE Faculty Assigned  Project) |
| 13 | Microcontroller and IMU sensor based Auto Balancing Human Carrier | KIET  (CoE Faculty Assigned  Project) |
| 14 | Force Feedback Mechanism of a Pilot  Stick for a Training Simulator Using  X-Plane and MATLAB | KIET  (CoE Faculty Assigned  Project) |
| 15 | Line Following Quadcopter | KIET  (CoE Faculty Assigned  Project) |

For the details of some of the of in-progress industry projects at College of Engineering see **below:**

|  |  |  |
| --- | --- | --- |
| **S.No** | **Project Title** | **Industry/Company** |
| 1 | Design and Fabrication Of Anthropomorphic  Robotic  Elegant System Operated with Notable  Assistance Aresona | (CoE Faculty Assigned  Project) |
| 2 | Thermal Design of A Turbine For A 2.5 KVA  Organic Rankine  Cycle System | (CoE Faculty Assigned  Project) |
| 3 | Force Feedback Sidestick for A Training  Simulator | (CoE Faculty Assigned  Project) |
| 4 | Pattern Forming Robots Using Swarm  Intelligence | (CoE Faculty Assigned  Project) |
| 5 | Auto Balancing Human Carrier | (CoE Faculty Assigned  Project) |
| 6 | Microcontroller Based Design and Fabrication of Humanoid Robot. | (CoE Faculty Assigned  Project) |
| 7 | Thermal and Hydraulic Design of an  Evaporator and Condenser for a 2.5 kVA  Organic Rankine Cycle | (CoE Faculty Assigned  Project) |
| 8 | Simultaneous Localisation and Mapping with Kinect using Robot Operating System and Adaptive Monte Carlo Localizaion Algorithm. | (CoE Faculty Assigned  Project) |
| 9 | Design Autonomous Flight Controller in HIL Mode | (CoE Faculty Assigned  Project) |
| 10 | ROS – Based Multiagent Shape Forming  UGVs | (CoE Faculty Assigned  Project) |
| 11 | Design of 3D Printer for Fabrication of Object Using Soft Polymer Layer by Layer Technique. | (CoE Faculty Assigned  Project) |
| 12 | Design and Fabrication of Autonomous Robotic System Operated with Notable Assistance. | (CoE Faculty Assigned  Project) |
| 13 | Microcontroller and IMU sensor based Auto Balancing Human Carrier | (CoE Faculty Assigned Project) |
| 14 | Force Feedback Mechanism of a Pilot  Stick for a Training Simulator Using XPlane and MATLAB | (CoE Faculty Assigned  Project) |
| 15 | Line Following Quadcopter | (CoE Faculty Assigned  Project) |

## Guest Speaker Sessions

Guest Speaker Sessions and Seminars provide, an opportunity to the students and faculty to benefit from the experience of prominent corporate executives and technology professionals.

Prominent speakers are invited from the industry and education sector to highlight current issues, trends and concerns of the industry and academia.

Guest Speaker Sessions provide a perspective to the students for evaluating theoretical concepts and transforming them into realistic plans. The details of some sessions follow below:

**GUEST SPEAKER SESSIONS: TOPICS & SPEAKERS**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S.No** | **Course** | **Faculty** | **Guest Speaker** | **Topic** |
| 1 | Engineering Project  Management | Dr.Muzafar | Mr. Abdul  Majeed  Sheikh | Project Management in Industry |
| 2 | Data Communication, Fundamental of Pysics | Amna Saleem, Ejaz  Tayyab, Hassan Naqvi | Mr. Kashan Raza | Software Defined Radio |
| 3 | Community Service | Sajjad Hussan | Mr. Anum Mazhar | Community Relationship in our life |
| 4 | Introduction to Computer Programming | M.Atif Shahbaz | M. Aaqib Shahbaz | Electrical Machines |
| 5 | Microprocessors &  Microcontroller Based Systems | Faizan Jawaid | Ali Rao | Role of MMBS in Markiting |
| 6 | Automation & Robotics | Shahid Jan, Farhan Azeem, | Mr. Shahid Hussain | Automation Robotics its Application |
| 7 | Electronic Instrumentation and Measurement | Faizan Jawaid | Shamim Akhtar | Instrumentation |
| 8 | C.A.E.Des | Faizan Jawaid | Tahir Habib | Solid Works for Industry |
| 9 | Fundamentals of Electronics | Anwar Pasha | Nazir Ahmed | Fundamental of Electronics |
| 10 | Leadership & Motivation | Sajjad Hussan | Mr. Syed  Kamran  Naqvi | Health Safety Enuivoroment |
| 11 | Linear Integrated Circuits & Applications | Noman Masood | Salman Kabir | Career Concealing |
| 12 | Digital Logic Fundamentals | Atif Shahbaz Kamran Ali khan | Sundus Ali | Embedded Systems |

## Industry Projects

As part of the curriculum, students are encouraged to undertake a major industry project that fulfills the requirements of a selected organization.The project provides the students with the experience of applying concepts, tools and methodologies learned during the course of their academic program.Industry projects allow students to personally experience pressures generated by deadlines under constraints of time and resources.

|  |  |  |
| --- | --- | --- |
| **Total No. Of Industry Projects** | **Completed** | **In Progress** |
| Engineering | 210 | 80 |
| Computer Science | 1221 | 122 |
| Management Science | 863 | 15 |

For the details of some of the of in-progress industry projects at College of Engineering see **below:**

|  |  |  |
| --- | --- | --- |
| **S. No** | **Project Title** | **Industry/Company** |
| 1 | Navigating Robot | KIET  (CoE Faculty Assigned Project) |
| 2 | 3D Map Generation using SLAM | KIET  (CoE Faculty Assigned Project) |
| 3 | Accurate geo-location from GPS/INS using sensor fusion techniques for Mobile Robots | KIET  (CoE Faculty Assigned Project) |
| 4 | Automatic Number Plate | KIET  (CoE Faculty Assigned Project) |
| 5 | Pipeline Leakage detection system through Accelerometer | KIET  (CoE Faculty Assigned Project) |
| 6 | DC/DC Boost and Buck Boost Converter | KIET  (CoE Faculty Assigned Project) |
| 7 | Collaborative Control Mobile Robots | KIET  (CoE Faculty Assigned Project) |
| 8 | Speed Control and Synchronization of a BLDC Master Motor with Slave | KIET  (CoE Faculty Assigned Project) |
| 9 | AutoSampler for Chemical Processing | KIET  (CoE Faculty Assigned Project) |
| 10 | Wireless Biped Robot | KIET  (CoE Faculty Assigned Project) |

|  |  |  |
| --- | --- | --- |
| 11 | Home Energy Management System | KIET  (CoE Faculty Assigned Project) |
| 12 | Sorting Machine by Weighting of the Product Produced | KIET  (CoE Faculty Assigned Project) |
| 13 | Building Automation and Control System | KIET  (CoE Faculty Assigned Project) |
| 14 | High-Speed CMOS LVDS IO Design | KIET  (CoE Faculty Assigned Project) |
| 15 | Quadcopter for Mine Detection | KIET  (CoE Faculty Assigned Project) |
| 16 | Power Factor Correction | KIET  (CoE Faculty Assigned Project) |
| 17 | Scara Robot | KIET  (CoE Faculty Assigned Project) |
| 18 | Driver Drowsiness Detection | KIET  (CoE Faculty Assigned Project) |
| 19 | Smart Home | KIET  (CoE Faculty Assigned Project) |
| 20 | Automatic Fabric Inspection Machine | KIET  (CoE Faculty Assigned Project) |
| 21 | Induction Heater | KIET  (CoE Faculty Assigned Project) |
| 22 | Smart Home Automation | KIET  (CoE Faculty Assigned Project) |

## Industrial Visits

As an integral part of engineering curriculum, students are taken to various industrial setups to provide them a first-hand experience of witnessing the working of industry vis-à-vis manufacturing processes, assembly lines, product development, operation and maintenance of the installed systems etc.

The engineering students have so far visited:

* Pakistan Beverage Limited
* YKK (Zippers)
* Shaheen Airline
* Yamaha Motor Pakistan
* Thal Engineering
* Progressive Group of Companies
* Internation Textile
* Philips Electrical Industries
* Atlas Honda Limited
* PAK-ARAB Refinery Limited (PARCO)
* Meteorological Complex
* Civil Aviation Authority
* Pakistan International Airlines
* English Biscuit Manufacturing
* Pakistan Cables Ltd
* Crescent Steel Allied Product Ltd
* Karachi Tools Dies & Molds Center (KTDMC)
* Pakistan Steel Mill
* Machine Tool Factory
* Peoples Steel Mill
* Hino Pak Motors
* Pakistan Refinery Ltd
* Siemens Pakistan Ltd
* Pakistan Telecommunication Corporation Ltd
* SimCon International
* Toyota-Daihatsu-Indus Motors Co Ltd
* Pak Suzuki Motors Co. Ltd
* Karachi Electric Supply Corporation
* Dawlance (United Refrigeration Industries)

## Commercialization of Research Findings

10. A Technology Innovation Center has recently been created with a provision of consultancy services has been established not only to get industry-sponsored projects but also with a strategy to find the potential beneficiaries of R&D undertakings and to commercialize the engineering expertise for mutual benefits of the user organization (client) as well as the institution itself. In this context, some previous data is presented in the table below: 11. Tibec project 12.

**COUPLED TANKS SYSTEM (MIMO)**

Designed in association with Prof. Dr. Bilal Kadri, the Coupled Tanks system consists of two pumps with five tanks. Each tank is instrumented with a pressure sensor to measure the water level. The pump drives the water from the bottom basin up to the top of the system. Depending on how the outflow valves are controlled, the water then flows to the top tanks, bottom tanks, or both. The rate of flow can also be changed using outflow orifices with different diameters. The ability to direct water flow, together with variable outflow orifices with two or more coupled tanks allows for several interesting Multiple Input Multiple Output (MIMO) experiments.

**METALLIC ROBOTIC ARM**

The aim to design this robotic arm is to provide the concepts from theory regarding the DH parametrization of Robotic arm to implement the forward and inverse kinematics while understanding its application. This table mounting robotic arm with driving voltage of 4.8V is being controlled with ATmega 2560 controller. Each degree of freedom is controlled by servo motor. Absolute encoder are connected with servo motors to determine the exact position and orientation of robotic arm. This application can be used widely such as in drilling operations, painting and welding etc.

**VISION SYSTEM (Mubassir)**

The objective is to design and develop a system that can capture the vision-based trajectory of robots. In order to perform this operation a good resolution and high FPS (Frame per second) camera is used which passes the captured video feed is transferred to a single board computer known as Raspberry Pi v3 which is considered as the brain of this system. For identification of individual robots, each pattern with black and white tags is attached on the top of robots which helps them to be tracked by the installed systems. ARUCO library is used for detecting the patterns. The tracking record and values are obtained on clients PC, the whole system is integrated with ROS which helps in determining the X, Y position and orientation, theta of the robot.

**INTELLIGENT FIRE FIGHTING AND DISASTER MITIGATION MOBILE ROBOTS**

Aim is to design a portable and robust robot which can work in hazardous environments and shows intelligent behavior such as object detection, target tracking and coordination. The robot can traverse an unknown environment with the help of on-board sensors and an intelligent navigation system. State of the art sensors include LIDAR, thermal imaging camera, INS, GPS and Ultra sonic sensors. The robot has the capability to identify the seat of fire and move towards it while carrying a fire hose. The intelligent control scheme by processing all the available sensory information decides the best possible path for the robot. Depending on the scenario, a detachable mechanical assembly of a fire hose or a robotic arm can be installed at the top of robot. With the help of robotic arm our robot can act as an explosive ordinance disposal (EOD) robot.

**SMART CONVERTIBLE WHEELCHAIR**

The project provides mobility to the physically challenged people. The wheelchair is electronically controlled capable of providing an orthostatic position to its user and can be converted into stretcher. It is powered by a rechargeable battery and its movement is controlled by a keypad. The main objective is to operate the wheelchair outdoors and indoors. Furthermore, this project has been introduced to TIBEC

(Technology Innovation and Business Incubation Centre) as a startup. Currently it has been sponsored

by Agha Khan University Hospital

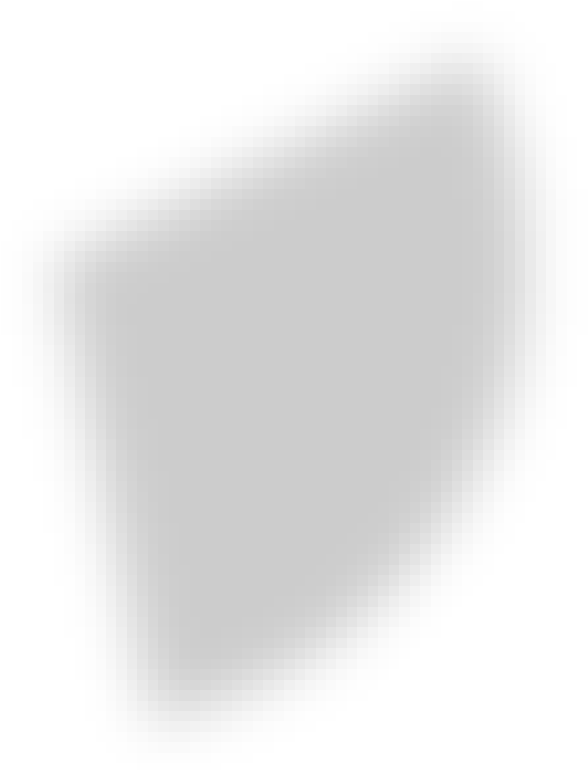
ANNEXURES

# ANNEXURE-A

|  |  |  |  |
| --- | --- | --- | --- |
| **K1** | **K2** | **K3** | **K4** |
| Engineering Physics | Calculus | Engineering Drawing | Electrical Machines |
|  | Linear Algebra | Digital Logic Fundamentals | Theory of Machines |
|  | Differential Equations and Transforms | Linear Circuit Analysis | Linear Control Systems |
|  | Complex Variables and Multivariable Calculus | Electrical Network Analysis | Microcontroller based Systems |
|  | Numerical Methods | Signals and Systems | Instrumentation and Measurement |
|  | Probability Methods in Engineering | Fundamentals of Electronics | Linear ICs and Applications |
|  | Introduction to Computer Programming | Electronic Circuit Design | Fundamentals of Thermal Sciences |
|  |  | Materials and Manufacturing Process |  |
|  |  | Mechanics of Materials |  |
|  |  | Engineering Statics |  |
|  |  | Engineering Dynamics |  |
|  |  | Fluid Mechanics |  |
|  |  | Workshop Technology |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **K5** | **K6** | **K7** | **K8** |
| English I (Proficiency Development) | Sensors and Actuators | Leadership and Motivation | SDP I |
| English II (Public Speaking) | Industrial Control and Automation | Technology Entrepreneurship | SDP II |
| English III (Official Communication and Report Writing) | Machine Design | Project Management |  |
|  | Power Electronics | Pakistan and Islamic Studies |  |
|  | Robotics | Community Service |  |
|  | Mechatronics System Design | Professional and Social Ethics |  |
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**Knowledge Profile**

K1

K2

K3

K4

K5

K6

K7

K8

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Knowledge Profiles*** | ***Courses*** | ***CLOs*** | ***PLOs*** | ***Blooms Taxonomy*** |
| K2 | Introduction to computing | **CLO1**: Identify the components of a computer system, demonstrate basic proficiency in computer and commonly used computer (system and application) softwares. | **PLO1** | **C1: Knowledge** |
| **CLO2**: Describe and explain the basics of computer and network organization including memory and storage elements in terms of bits and bytes, and recognize data representation in terms of number systems. | **PLO1** | **C2: Understand** |
| **CLO3**: Demonstrate problem solving skills through the use of flow charts and algorithms, and apply the acquired knowledge to develop small-scale computer programs. | **PLO2** | **C3: Apply** |
| K2 | Introduction to computing (Lab) | **CLO1**: Recall the associated concepts form theory regarding basic concepts of C programming. | **PLO1** | **C1** (Recall) |
| **CLO2**: Problem identification, followed by thorough analysis and literature review, resulting in meaningful conclusions | **PLO2** | **C4** (Analyze) |
| **CLO3**: Design/Develop solutions for complex engineering problems covered under the scope of this course. | **PLO3** | **C3** (Apply) |
| **CLO4**: Demonstrate and illustrate the basic functions and working of MS Word, MS PowerPoint, MS Excel, MS Access. | **PLO1** | **C3** (Apply) |
| **CLO5**: Apply and discover different basic level functions of MATLAB and LABVIEW according to the required condition. | **PLO5** | **C3** (Apply) |
| **CLO6**: Apply basic C concepts and write, debug and execute programs in C language and apply the concept of C programming and construct and design a system using Arduino. | **PLO1** | **C3** (Apply) |
| **CLO7**: Properly handle lab infrastructure with safety precautions | **PLO8** | **P2** (Set) |
| **CLO8**: Assume responsibility and the use of resources to complete the assigned task with proper Teamwork | **PLO9** | **A3(**Assume responsibility**)** |
| K2 | Introduction to computer programming | **CLO1**: Identify stages involve in program life cycle and record steps for problem solving skills through the use of flow charts, algorithms and actual code. | **PLO12** | **C1: Knowledge** |
| **CLO2**: Observe syntactical and logical details of the C language and infer solutions in terms of programs in C. | **PLO1** | **C2: Understand** |
| **CLO3**: Experiment with different static and dynamic data structures, and apply the acquired knowledge to develop small-scale computer programs. | **PLO1** | **C3: Apply** |
| K2 | Introduction to Computer Programming Lab | CLO1: Recall the associated concepts of programming form theory | **PLO1** | **C1** (Recall) |
| CLO2: Problem identification, followed by thorough analysis and literature review, resulting in meaningful conclusions | **PLO2** | **C4** (Analyze) |
| CLO3: Design/Develop solutions for complex engineering problems covered under the scope of this course. | **PLO3** | **P4** (Mechanism) |
| CLO4: Implement different programming concepts i.e. input and output functions, conditional constructs and repetitive constructs. Pointes, Functions, Arrays, Structures, Dynamic Memory Allocation and observe their working | **PLO3** | **C3(**Apply) |
| CLO5: Interfacing different sensors using an Arduino board and programming in Arguing | **PLO5** | **P3** ( Operate ) |
| CLO6: Properly handle lab infrastructure with safety precautions | **PLO8** | **P2** (Set) |
| CLO7: Assume responsibility and the use of resources to complete the assigned task with proper Teamwork | **PLO9** | **A3(**Assume responsibility**)** |
| K2 | **Algorithms and Data Structures** | CLO1: Differentiate among alternative algorithms, and infer a  suitable one for solving underlying problem. | **PLO\_02** | C4: Analyze |
| CLO2: Develop small-to-moderate algorithms to access and  modify linear data structures for practical engineering  problems. | **PLO\_03** | C3: Apply |
| CLO3: Evaluate algorithms for non linear data structures to  solve practical engineering problems. | **PLO\_03** | C5: Evaluate |
| K2 | **Algorithms and Data Structures Lab** | CLO1: Recall the associated concepts form theory regarding programming data structures. | **PLO1** | **C1** (Recall) |
| CLO2: Problem identification, followed by thorough analysis and literature review, resulting in meaningful conclusions | **PLO2** | **C4** (Analyze) |
| CLO3: Design/Develop solutions for complex engineering problems covered under the scope of this course. | **PLO3** | **C3**(Apply) |
| CLO4: Experiment with different data structures; implement those structures using algorithms to solve practical engineering problems. | **PLO3** | **C3** (Apply) |
| CLO5: Select a suitable data structure for solving practical engineering problems to validate the working of different data structures | **PLO2** | **C4** (Analyze) |
| CLO6: Properly handle lab infrastructure with safety precautions | **PLO8** | **P2** (Set) |
| CLO7: Assume responsibility and the use of resources to complete the assigned task with proper Teamwork | **PLO9** | **A3(**Assume responsibility**)** |
| K3 | Engineering Drawing | CLO1: Illustrate orthographic projections with Dimensions. | **PLO\_3** | C3  (Analysis) |
| CLO2: Sketch isometric drawing from multi views of an object. | **PLO\_3** | C2  (Understanding &  Applying) |
| CLO3: Recognize features in a standardized Assembly drawing for reproduction. | **PLO\_3** | C2  (Understanding &  Applying) |
| K3 | Engineering Drawing Lab | CLO1: Familiarization with solid works tools and their usage | **PLO1** | P1(observe) |
| CLO2: Use of solid works software tools and to craft predefined objects under guided supervision | **PLO5** | P3(Guided Response) |
| CLO3: Design/Develop solutions for complex engineering problems covered under the scope of this course | **PLO3** | P4 (Mechanism) |
| K5 | Workshop Technology | CLO1: Introduction of workshop tools and machines | **PLO1** | P1 (Observe) |
| CLO2: Use of workshop tools and (lathe, milling and shaping) machines to craft predefined objects and perform basic household wiring under guided supervision | **PLO5** | P3(Guided Response) |
| CLO3: Design/Develop solutions for complex engineering problems covered under the scope of this course | **PLO3** | P4 (Mechanism) |
| CLO4: Assume responsibility and the use of resources to complete the assigned task with proper Teamwork | **PLO9** | A3(Assume responsibility) |
| CLO5: Apply the knowledge gained to solve practical examples from a lifelong perspective | **PLO12** | C3 (Apply) |
| CLO6: Properly handle lab infrastructure with safety precautions | **PLO8** | P2 (Set) |
| K3 | Linear Circuit Analysis | CLO1: Develop understanding of:   * Basic electrical circuits * And skills to analyze these circuits | PLO\_1 | C2 (Understand) |
| CLO2: Learning to apply network laws and theorems on linear circuits | PLO\_2 | C3 (Apply) |
| CLO3:Develop ability to select appropriate technique to find solution by circuit analysis | PLO\_2 | C4 (Analyze) |
| K3 | Linear Circuit Analysis Lab | CLO1: Recall the associated concepts form theory regarding the active and passive circuit elements and the circuit analysis techniques and theorems. | **PLO1** | **C1** (Recall) |
| CLO2: Problem identification followed by thorough analysis and literature review resulting in meaningful conclusion. | **PLO2** | **C3**(Apply) |
| CLO3: Design/Develop solutions for complex engineering problems covered under the scope of this course. | **PLO3** | **P4** (Mechanism) |
| CLO4: Observe and experimentally validate the studied circuit theorems and analysis techniques using the studied circuit elements such as resistors, capacitors, inductors and voltage/current sources. | **PLO4** | **P3** (Guided Response) |
| CLO5: Operate the Multisim CAD tool circuit SPICE simulator for the given circuits. | **PLO5** | **P3** (Operate) |
| CLO6: Properly handle lab infrastructure with safety precautions. | **PLO8** | **P2**(Set) |
| CLO7: Assume responsibility and the use of resources to complete the assigned task with proper Teamwork. | **PLO9** | **A3(**Assume responsibility**)** |
| K3 | Electrical Network Analysis | CLO1: Understand Complex Frequency Approach to AC circuits | **PLO\_1** | C2 (understanding) |
| CLO2: Analysis of polyphase AC Circuits | **PLO\_2** | C3 (Analyzing) |
| CLO3: Be able to understand Laplace Transform and Bode Plots | **PLO\_1** | C2 (Understanding) |
| K5 | Engineering Mechanics | CLO1: Ability to apply principles of mechanics; Newton’s laws, work-energy methods, momentum methods etc., and conditions of equilibrium, method of moments etc. to variety of engineering problems that are being extracted from real time problems | **PLO\_1** | C1, C3 and C4 (Applying & Analyzing) |
| CLO2: Ability to get dynamical equation of a particle or body in the presence of various forces, using free body diagrams, and to evaluate kinematical and/or dynamical quantities from these equations, and interpreting the results (possibly in the form of graphs). Similarly evaluating forces in equilibrium problems, using free body diagrams. | **PLO\_1** | C1, C3 and C4 (Applying & Analyzing) |
| CLO3: To develop overall skill of critical thinking by discussing various possibilities of a given problem. To reconcile established rules of mechanics with intuition. | **PLO\_4** | C4 and C5  (Analysis and Evaluation) |
| K4 | Electrical Machines | CLO1: Application of Faraday’s Lenz’s Law to Electrical Machine working fundamentals. Examine simple magnetic circuits ,Examine the magnetic field, reluctance of magnetic materials, flux and mmf in magnetic circuits | **PLO\_1** | C4 (Analyze) |
| CLO2: Analyze the performance of Static Induction Machines :three- and single-phase transformers and Rotary Induction Machines: single phase and three phase induction motors | **PLO\_2** | C4 (Analyze) |
| CLO3:To analyze the parameters performance of three-phase synchronous motors/generators | **PLO\_2** | C4 (Analyze) |
| CLO4:To analyze the parameters and performance of dc generators and motors | **PLO\_2** | C4 (Analyze) |
| K4 | Electrical Machines Lab | CLO1: Recall the associated concepts form theory regarding Electrical Machines | **PLO1** | **C1** (Recall) |
| CLO2: Problem identification, followed by thorough analysis and literature review, resulting in meaningful conclusions | **PLO2** | **C3** (Apply) |
| CLO3: Design/Develop solutions for complex engineering problems covered under the scope of this course. | **PLO3** | **P4** (Mechanism) |
| CLO4: Observe and experimentally validate the working of various machines and their data handling. | **PLO4** | **P3** (Guided Response) |
| CLO5: Simulation of various Electrical Machines using MATLAB. | **PLO5** | **P3** (Operate) |
| CLO6: Properly handle lab infrastructure with safety precautions | **PLO8** | **P2** (Set) |
| CLO7: Assume responsibility and the use of resources to complete the assigned task with proper Teamwork | **PLO9** | **A3(**Assume responsibility**)** |
| K3 | Fundamentals of Electronics | CLO1: Review of some basic concepts of Electrostatics, Semiconductor Device Physics, eventually leading to the development of a current-voltage relationship for a PN-Junction | **PLO\_1** | C2 (Understanding) |
| CLO2: Extending/Applying the concepts of Device Physics established earlier for the understanding of PN-Junction to a relatively complex three-terminal Bipolar Junction Transistor (BJT), | **PLO\_2** | C3(Applying) |
| CLO3: Study of BJT’s Modeling, AC and DC Circuit Analysis and Applications, BJT as Amplifier | **PLO\_3** | C3(Applying) |
| K3 | Fundamentals of Electronics lab | **CLO1: Understand** or Identify the unique vocabulary associated with solid state devices. Operate electronic test equipment such as multimeter, power supply, function generator, oscilloscope. | PLO\_1 | **C1** (Recall) |
| CLO2: Problem identification, followed by thorough analysis and literature review, resulting in meaningful conclusions | PLO2 | **C3 (Apply)** |
| **CLO3: Design/Develop** solutions for complex engineering problems covered under the scope of this course | PLO\_3 | **P4 (Mechanism)** |
| **CLO4: Experimentally** validate the basic concepts of Semiconductor diodes such as P-N junction diode IV characteristic. Apply the basics of diode to describe the working of rectifier circuits such as Full and half wave rectifiers through **guidance** and **experimentally manipulate** the application of transistors for Current and voltage amplification, characteristics of different amplifier configurations design and analyze the different biasing circuits. | PLO\_4 | **P3 – (Operate under supervision / Manipulate with guidance)** |
| CLO5: Be able to **manipulate /examine /compute** biasing circuits of solid-state devices through modern tool usage (MULTISIM). | PLO\_5 | **P3 (Operate)** |
| CLO6: Properly set/handle lab infrastructure with safety precautions | PLO\_8 | **P2 (Set)** |
| CLO7: Be able to assume **responsibility** and use resources to achieve assigned goals through Teamwork. | PLO\_9 | **A3 – (Behave according to / show concern / assume responsibility)** |
| K3 | Electronic Circuit Design | CLO1: Develop a relatively advanced level of understanding regarding MOSFET and BJT devices | PLO\_2 | C2 (Understanding) |
| CLO2: Develop equivalent models for MOSFET and BJT devices both for low and high frequency regimes | PLO\_2 | C3 (Applying) |
| CLO3: Application of the advanced understanding of the devices to step-wise design/synthesis of single-stage MOSFET and BJT based amplifiers | PLO\_3 | C6 (Creating) |
| K3 | Electronic Circuit Design Lab | **CLO1: Understand** or Identify the unique vocabulary associated with BJT and MOSFET devices for both low and high frequency regimes.. Operate electronic test equipment such as multimeter, power supply, function generator, oscilloscope. | PLO\_1 | **C2 (Understanding)** |
| **CLO2: Experimentally** validate the basic concepts of amplifiers and their characteristics including biasing, AC/DC response, gain, input/output impedance and frequency response. Apply the basics of BJT and MOSFET to describe the working of single stage CE amplifier circuit and its frequency response, cascade amplifier,cascode amplifier, push-pull amplifier and CMOS design through **guidance** and **experimentally manipulate** the application of transistors for Current and voltage amplification, characteristics of different amplifier configurations design and analyze the different biasing circuits. | PLO\_4 | **P3 – (Operate under supervision / Manipulate with guidance)** |
| **CLO3: Design/Develop** solutions for complex engineering problems covered under the scope of this course | PLO\_3 | **P4 (Mechanism)** |
| CLO4: Be able to **manipulate /examine /compute** biasing circuits of solid-state devices through modern tool usage (MULTISIM). | PLO\_5 | **P3 (Operate)** |
| CLO5: Be able to assume **responsibility** and use resources to achieve assigned goals through Teamwork. | PLO\_9 | **A3 – (Behave according to / show concern / assume responsibility)** |
| CLO6: Properly set/handle lab infrastructure with safety precautions | PLO\_8 | **P2 (Set)** |
| K3 | Digital Logic Fundamental | CLO1: Be able to understand the concepts of the basic logic gates. Should be able to explain the relationship between algebraic expression and digital circuits | PLO\_1 | C2  (Understand) |
| CLO2: Be able to construct interconnection of logic gates to form more complex circuits..Should be able to apply their knowledge of digital logic circuits to real world problems. | PLO\_1 | C3 (Apply) |
| CLO3: Be able to differentiate between sequential and combinational circuits. Be able to explain and analyze the role of flip flops. Analyze the behavior of digital arithmetic circuits | PLO\_2 | C4 (Analyze) |
| K3 | Digital Logic Fundamental Lab | CLO1: Recall the associated concepts form theory regarding various digital logic and signal Conditioning Circuits. | PLO1 | C1 (Recall) |
| CLO2: Problem identification, followed by thorough analysis and literature review, resulting in meaningful conclusions | PLO2 | C3 (Apply) |
| CLO3: Design/Develop solutions for complex engineering problems, making use of techniques used in labs to design a project. | PLO3 | P4 (Mechanism) |
| CLO4: Observe and experimentally validate the working of various sensors, their calibration, and data handling. | PLO4 | P3 (Guided Response) |
| CLO5: Operate the Proteus cad tool circuit spice simulator for the given logics. | PLO5 | P3 ( Operate ) |
| CLO6: Properly handle lab infrastructure with safety precautions | PLO8 | P2 (Set) |
| CLO7: Assume responsibility and the use of resources to complete the assigned task with proper Teamwork | PLO9 | A3(Assume responsibility) |
| K6 | Computer Architecture & Organization | CLO1: Be able to discover, associate and apply  the concepts of the architecture and  organization of a von Neumann machine  and its major functional units; memory  management, the fetch-execute cycle. | PLO\_1 | C3  ( Applying) |
| CLO2: Be able to explain and analyse the role of  interrupts. Be able to explain and analyse  the design of the 8086/88 microprocessor. | PLO\_2 | C4  (Analyzing) |
| CLO3: Develop ability to correlate, conclude and  interpret the data in a methodical way  resulting in the synthesis of information  leading towards the derivation of  Conclusions. Develop and compile simple  programs coded in assembly language. | PLO\_3 | C4, C5  (Analysing &  Evaluating) |
| K4 | Signals & Systems | CLO1: Express the concepts of signals and systems and their different types which can be used in a wide variety of disciplines in engineering | PLO\_1 | C2 |
| CLO2: Identify and report system properties such as causality, stability, linearity, and time invariance etc. | PLO\_1 | C3 |
| CLO3: Apply the convolution integral formulas to determine the output of continuous time systems. | PLO\_1 | C4 |
| CLO4: Analyze continuous time signals and systems in the time/frequency-domain using Fourier and Laplace transforms. | PLO\_2 | C5 |
| K3 | Electromagnetic Fields & Waves | CLO1: To describe concept of electrics field and its calculation from given charge distributions. Learn Gauss Law and its application. Calculate potential and Energy Content in an Electric Field. | PLO\_1 | C2 |
| CLO2: To employ Electric Field concepts in materials like conductors and dielectrics. Analyze solve boundary related problems and get familiar with resistance and capacitance. | PLO\_2 | C3 |
| CLO3: To explain the concepts of current and current density | PLO\_1 | C2 |
| CLO4: To describe the concept of Magnetic Field and its calculation from given current distributions. To understand Lorentz Force and its calculations. Be able calculate CURL of Magnetic Field | PLO\_1 | C2 |
| CLO5: To explain Faraday’s Law and how it relates electric and magnetic field. Understand the concept of displacement current. Understand Maxwell’s Equation and how it leads to Wave Equation. | PLO\_1 | C2 |
| CLO6: Define uniform plane wave, its propagation in conductors and dielectrics, its reflection and refraction, and the power it flows along the distance. | PLO\_2 | C1 |
| K2 | Probability Methods In Engineering | **CLO1: Apply** the basic techniques of the descriptive statistics. | PLO\_2 | C3 (Applying) |
| **CLO2: Apply** the basic concepts of probability applicable in the solution of engineering problems. | PLO\_2 | C3 (Appling) |
| **CLO3: Evaluate** the population parameters on the basis of sample using the techniques of inferential statistics. | PLO\_2 | C5 (Evaluating ) |
| K4 | Communication Systems | CLO1: Analyze the periodic and non-periodic signals using Fourier series and Fourier transforms respectively. | PLO\_2 | C4 |
| CLO2: Applying knowledge related to the concepts and techniques of communication systems, analog modulation (AM, FM & PM), line coding (RZ, NRZ, & Manchester), digital modulation (ASK, FSK & PSK), pulse modulation (PCM, PAM, PPM, & PWM) in time and frequency domains. | PLO\_1 | C3 |
| CLO3: Analyzing encoding techniques, and various multiplexing schemes (TDMA, FDMA, &CDMA) using the concepts of information theory. | PLO\_2 | C4 |
| CLO4: Designing of various transmitters and receivers used in amplitude and frequency modulation. | PLO\_3 | C5 |
| K4 | Communication Systems Lab | CLO1: Recall the working knowledge of the equipment needed to  ensure data transfer among different communication systems. | **PLO1** | **C1** (Recall) |
| CLO2: Observe and experimentally validate the studied Analog modulation techniques like Amplitude Modulation (AM) and Frequency Modulation (FM) then Digital Communication techniques like Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK) and Phase Shift Keying (PSK) and after  that Pulse Code Modulation | **PLO4** | **P3** (Guided Response) |
| CLO3: Operate the MATLAB tool to simulate the modulation and demodulation techniques. | **PLO5** | **P3** (Operate) |
| CLO4: Design/Develop solutions for complex engineering problems covered under the scope of this course complex engineering problems covered under the scope of this course | **PLO3** | **P4** (Mechanism) |
| CLO5: Assume responsibility and the use of resources to complete the assigned task with proper Teamwork | **PLO9** | **A3(**Assume responsibility**)** |
| CLO6: Properly handle lab infrastructure with safety precautions | **PLO8** | **P2** (Set) |
| K4 | Microprocessor Based Systems | CLO1: Understand the fundamental architecture and working of microprocessors and microcontrollers in general and PIC18F series Microcontroller in particular. | PLO\_1 | C2 (Understand) |
| CLO2: Develop problem solutions and analyze low-level language programs using PIC18F452/458 microcontroller | PLO\_3 | C5 (Synthesis) |
| CLO3: Analyzing and using PIC18F452/458 microcontroller on-chip peripherals in assembly language | PLO\_1 | C4 (Analyze) |
| K4 | Microprocessors Based System Lab | CLO1: Recall the associated concepts form theory regarding microprocessor systems and architecture with interfacing techniques. | **PLO1** | **C1** (Recall) |
| CLO2: Problem identification, analysis /literature review, resulting in meaningful conclusions | **PLO2** | **C3** (Apply) |
| CLO3: Design / Develop solutions for open ended problems covered under the scope of this course | **PLO3** | **P4** (Mechanism) |
| CLO4: Observe the working of various module of microprocessor and micro- controllers’ interface with different sensors and displays according to the lab task | **PLO4** | **P3** (Guided Response) |
| CLO5: Interfacing different Input / Output peripherals devices with micro- controller. | **PLO5** | **P3** (Operate) |
| CLO6: Properly handle lab infrastructure with safety precautions | **PLO8** | **P2** (Set) |
| K4 | Linear Control System | CLO1: Be able to **apply** modeling techniques to develop electrical, mechanical transfer functions. Be able to **construct** the block diagrams, and state variable representation. Should be able to i**nterpret** the first and second order systems. The gained knowledge can be applied to physical systems. | PLO\_1 | C3 (Applying) |
| **CLO2: Analyze** the stability of physical systems. Explain the steady state behavior. Be able to **analyze** the transient response of physical systems using root locus techniques. | PLO\_2 | C4 (Analyzing) |
| CLO3: Be able to **assess** the most suitable feedback controller (PI,PD, PID) for the specific problem in hand. Be able to **evaluate** the stability margins using Bode plots. | PLO\_3 | C5 (Evaluating) |
| K4 | Linear Control System Lab | CLO1: Recall the associated concepts form theory regarding the Control system, their response, transfer function, error correction, and controller designing techniques. | **PLO1** | **C1** (Recall) |
| CLO2: Be able to model and analyze first and second order electrical and mechanical systems, Ball and Beam, Magnetic Levitation and Process control trainer by finding their transfer function, and their open loop and closed loop response by applying different test inputs (step, ramp etc.) | **PLO2** | **C4** (Analysis) |
| CLO3: Be able to model and simulate first and second order electrical and mechanical systems, Ball and Beam, Inverted Pendulum, Magnetic Levitation and Process control trainer by using Matlab and Simulink | **PLO5** | **C3**(Apply) |
| CLO4: Investigating the system behavior for Designing and computation of Compensators and Controllers, to meet desired system performance characteristics | **PLO4** | **P3** (Guided Response) |
| CLO5: To effectively present the subject knowledge on the project assigned and final lab exam | **PLO3** | **P4** (Mechanism) |
| CLO6: Assume responsibility and the use of resources to complete the assigned task with proper Teamwork. | **PLO9** | **A3(**Assume responsibility**)** |
| CLO7: Properly handle lab infrastructure with safety precautions. | **PLO8** | **P2** (Set) |
| K4 | Instrumentation and Measurement | CLO1: Possible sources of error while performing electronic measurements | PLO1 | C4 |
| CLO2: Principles of operation, construction and loading effect of different meters | PLO1 | C4 |
| CLO3: Use of sensors for measuring different physical quantities ,Signal conditioning, and interfacing sensors with micro controller | PLO3 | C3 |
| K4 | Instrumentation and Measurement Lab | CLO1: Recall the associated concepts form theory regarding various sensors and signal Conditioning Circuits. | **PLO1** | **C1** (Recall) |
| CLO2: Problem identification, followed by thorough analysis and literature review, resulting in meaningful conclusions | **PLO2** | **C3** (Apply) |
| CLO3: Design/Develop solutions for complex engineering problems covered under the scope of this course. | **PLO3** | **P4** (Mechanism) |
| CLO4: Observe and experimentally validate the working of various sensors, their calibration, and data handling. | **PLO4** | **P3** (Guided Response) |
| CLO5: Interfacing different sensors & signal conditioning circuits with LabVIEW using an Arduino board. | **PLO5** | **P3**( Operate ) |
| CLO6: Properly handle lab infrastructure with safety precautions | **PLO8** | **P2** (Set) |
| CLO7: Assume responsibility and the use of resources to complete the assigned task with proper Teamwork | **PLO9** | **A3(**Assume responsibility**)** |
| K4 | Microwave and Antenna | CLO1: Explain Transmission Line mathematically and calculate S parameters which determine its performance. | PLO\_1 | C2 |
| CLO2: Designing solutions for maximum power transfer on Transmission Lines. | PLO\_3 | C6 |
| CLO3: Define Antenna, its ability to convert Electrical Energy into Electromagnetic Radiation. | PLO\_1 | C1 |
| CLO4: Differentiate between Antenna Structure, its radiation pattern, and measuring its performance. | PLO\_2 | C2 |
| K4 | Microwave and Antenna Lab | **CLO1: Study** of different types of transmission lines, antennas, active and passive microwave devices. | **PLO1** | **C2(understand)** |
| CLO2: Apply the basics of transmission line, antennas and active and passive microwave devices and describe the working of transmitter and receivers through **guidance** and  **Experimentally.** | **PLO4** | **P3 – (Operate under supervision / Manipulate with guidance),** |
| CLO3: Be able to **manipulate /examine /operate** the antenna, transmission line and active and passive microwave devices by using modern tool such as (ATC5000), (WT9000), HFSS  and ADS | **PLO5** | **P3 – (Operate under supervision / Manipulate with guidance),** |
| **CLO4: Develop & design** an antenna or transmission line by applying the concepts and techniques from theoretical  knowledge. | **PLO3** | **P4 (Mechanism)** |
| CLO5: Assume responsibility and the use of resources to complete the assigned task with proper **Teamwork.** | **PLO9** | **A3(Assume responsibility)** |
| CLO6: Properly handle lab infrastructure with **safety** precautions. | **PLO8** | **P2 (Set)** |
| K4 | Linear Integrated Circuits and Applications | CLO1: Develop understanding of key-parameters of an Opamp (such as Input and Output Impedance, bandwidth, offset, differential and common mode gains, etc.) through simpler first order circuits such as closed loop inverting amplifiers, summer, comparator, etc. | PLO\_1 | C2 (Understand) |
| CLO2: Develop understanding of internal implementation of Opamp which is made up of multi-stage MOSFETs/BJTs differential amplifier. | PLO\_1 | C2 (Understand) |
| CLO3: Apply Opamps to design and analyze closed loop relatively complex circuits such as analog filters, linear and non-linear oscillators and data-converters. | PLO\_3 | C3(Apply)  C6 (Create) |
| K4 | Linear Integrated Circuits and Applications Lab | CLO1: Recall the associated concepts form theory regarding the key parameters of an Op-Amp (its ideal characteristics, various configurations, DC imperfections) | **PLO1** | **C1** (Recall) |
| CLO2: Observe and Estimate specification of an Op-Amp by implementing its various configurations, and offset nulling techniques. | **PLO2** | **P1** (Observe) |
| CLO3: Construct and Model basic mathematical operations (comparator, summing and difference amplifier), filters, oscillators and data-convertors using Op-Amp-based circuits | **PLO4** | **C6**(Evaluate) |
| CLO4: Be able to Implement and evaluate various system-level applications such as Mathematical operation, filters, oscillators and data-converters using SPICE software NI-MultiSim | **PLO5** | **P3**(Guided Response) |
| CLO5: Design/Develop solutions for complex engineering problems covered under the scope of this course. | **PLO3** | **P4** (Mechanism) |
| CLO6: Assume responsibility and the use of resources to complete the assigned task with proper Teamwork. | **PLO9** | **A3(**Assume responsibility**)** |
| CLO7: Properly handle lab infrastructure with safety precautions. | **PLO8** | **P2**(Set) |
| K6 | Computer Communication Networks | CLO1: Understand and define essential concepts of communication protocols and layered network architectures, particularly OSI architecture. | PLO\_1 | C1 |
| CLO2: Recognize different internetworking devices and their functions within a network. | PLO\_1 | C3 |
| CLO3: Categorize basic network systems using the standard networking methods and protocols. | PLO\_2 | C4 |
| CLO4: Analyze structures, services and operations of various networks, transport and application layer protocols of communication stack. | PLO\_2 | C4 |
| K6 | Computer Communication Networks Lab | CLO1: Problem identification, followed by thorough analysis and literature review, resulting in meaningful conclusions | **PLO2** | **C4** (Analyze) |
| CLO2: Design/Develop solutions for complex engineering problems covered under the scope of this course. | **PLO3** | **C3** (Apply) |
| CLO3: Perform fundamental network connections and working of switch. | **PLO1** | **P2** (Model) |
| CLO4: Apply knowledge of various routing protocols and infer a suitable one for solving the underlying routing problem and understanding IP addresses and Subnetting. Moreover, to be able to apply appropriate engineering techniques and IT tools to enable switch security and VLAN functionality and understand the working of hub. | **PLO2** | **C4** (Analyze) |
| CLO5: Apply different symmetric and asymmetric encryption techniques using Cryptool and understand the basic concept and working of Wireshark. Moreover, apply encoding and decoding of message in data link layer. | **PLO5** | **C3** (Apply) |
| CLO6: Properly handle lab infrastructure with safety precautions | **PLO8** | **P2** (Set) |
| CLO7: Assume responsibility and the use of resources to complete the assigned task with proper Teamwork | **PLO9** | **A3(**Assume responsibility**)** |
| K4 | Digital Signal Processing | CLO1: Analysis of DT signals and systems in time domain | PLO\_2 | C4 (Analyzing) |
| CLO2: Analysis of DT systems using frequency domain tools like z-transform, Fourier transform and series, DFT, FFT etc | PLO\_2 | C4 (Analyzing) |
| CLO3: Design of FIR and IIR filters using a variety of techniques | PLO\_3 | C5 (Evaluating) |
| K4 | Digital Signal Processing Lab | CLO1: Recall the associated concepts form theory regarding digital signals and systems and their processing. | **PLO1** | **C1** (Recall) |
| CLO2: Problem identification followed by thorough analysis and literature review resulting in meaningful conclusion. | **PLO2** | **C3**(Apply) |
| CLO3: Design/Develop solutions for complex engineering problems covered under the scope of this course. | **PLO3** | **P4** (Mechanism) |
| CLO4: Ability to generate and process digital signals in time, frequency and z- domain to analyze the response of different signals and systems and observe their response on digital board. | **PLO4** | **P3** (Guided Response) |
| CLO5: Operate the MATLAB and Code Composer Studio to model signals and systems and apply various algorithms. | **PLO5** | **P3** (Operate) |
| CLO6: Properly handle lab infrastructure with safety precautions. | **PLO8** | **P2**(Set) |
| CLO7: Assume responsibility and the use of resources to complete the assigned task with proper Teamwork. | **PLO9** | **A3(**Assume responsibility**)** |
| K6 | Industrial Control & Automation | CLO1: Be able to relate and demonstrate the core concepts of Factory automation and its applications | PLO\_1 | C2, C3  (Understanding &Applying) |
| CLO2: Be able to analyze the critical aspects of designing solutions for Factory automation applications | PLO\_2 | C4 (Analyzing) |
| CLO3: Be able to evaluate the Factory automation solutions based on critical design parameters | PLO\_2 | C5 (Evaluation) |
| K6 | Industrial Control & Automation Lab | CLO1: Recall the associated concepts form theory regarding logic gates, truth tables, karnaugh map, differences b/w an analogue and digital signal, PWM and Duty Cycle and the functioning of transistors, relays, 3ϕ Induction Motors and switch gears. | **PLO1** | **C1** (Recall) |
| CLO2: Understand the given problem related to industrial scenarios and use the recalled engineering knowledge to formulate solutions in terms of ladder diagrams | **PLO2** | **C4** (Analysis) |
| CLO3: Understand the given problem linked to a certain industrial scenario and efficiently works on WPL-Soft and DOP-soft to produce appropriate ladder diagram and HMI screen. | **PLO5** | **C3**(Apply) |
| CLO5: Design/Develop solutions for the given problems. | **PLO3** | **P4** (Mechanism) |
| CLO6: Assume responsibility and the use of resources to complete the assigned task with proper Teamwork. | **PLO9** | **A3(**Assume responsibility**)** |
| CLO7: Properly handle lab infrastructure with safety precautions. | **PLO8** | **P2** (Set) |
| K6 | Introduction to Robotics | CLO1: Understand basic kinematics and dynamics of Industrial robots and manipulators | PLO4 | C4 (Analyze) |
| CLO2: Analyze different Robot configurations and subsystems | PLO2 | C4 (Analyze) |
| CLO3: Develop an Understanding of Trajectory and Path Planning, incorporate into Motion Control | PLO4 | C5 (Synthesis) |
| K6 | Introduction to Robotics Lab | CLO1: Recall the associated concepts form theory regarding the DH parametrization of Robotics arms, Forward Kinematics and Inverse Kinematics. | **PLO1** | **C1** (Recall) |
| CLO2: Problem identification, followed by thorough analysis and literature review, resulting in meaningful conclusions | **PLO2** | **C3** (Apply) |
| CLO3: Design/Develop solutions for complex engineering problems covered under the scope of this course. | **PLO3** | **P4** (Mechanism) |
| CLO4: Investigating the working and operation of robots to apply robot navigation and path plaining techniques to perform various tasks, including the experimental validation of DH parametrization, forward kinematics and inverse kinematics. | **PLO4** | **P3** (Guided Response) |
| CLO5: Examining the assembly and interfacing of Robotic kits (i.e. Lego kits, Zumo robots, robotic arm), with related software. | **PLO5** | **P3** ( Operate ) |
| CLO6: Properly handle lab infrastructure with safety precautions. | **PLO8** | **P2** (Set) |
| CLO7: Assume responsibility and the use of resources to complete the assigned task with proper Teamwork. | **PLO9** | **A3**(Assume responsibility) |
| K6 | FPGA-Based System Design | CLO1: Develop VHDL codes to offer solution  to digital design problems and its  functional verification. | PLO\_3 | C3 (Apply) |
| CLO2: Design and implement controllers  using FSM and partition designs into  control logic and data path. | PLO\_3 | C3 (Apply) |
| CLO3: Evaluate design trade-offs in terms of  area, speed and critical-path while  implementing digital designs. | PLO\_4 | C5 (Evaluating) |
| K6 | FPGA-Based System Design Lab | **CLO1: Understand** and remember the fundamental concept of FPGA architecture. | PLO\_1 | **C2 (Understanding)** |
| **CLO2: Experimentally** validate the basic concepts of digital logic circuits (either combinational or sequential) with the help of Hardware Description Language (VHDL), with the help of Spice Tool (Xilinx ISE 14.7). Apply the basic concept of component instantiation, adders, multipliers, registers and Finite state machine (FSM) (either Moore or Mealy) through **guidance** and **experimentally manipulate** the application according to problem or desired circuit. configurations design and analyze the different digital circuits. | PLO\_4 | **P3 – (Operate under supervision / Manipulate with guidance)** |
| **CLO3: Design/Develop** solutions for complex engineering problems covered under the scope of this course | PLO\_3 | **P4 (Mechanism)** |
| CLO4: Be able to **manipulate /examine /compute**the more efficient digital circuit through hardware description language by using modern tool usage (Xilinx ISE). | PLO\_5 | **P3 (Operate)** |
| CLO5: Be able to assume **responsibility** and use resources to achieve assigned goals through Teamwork. | PLO\_9 | **A3 – (Behave according to / show concern / assume responsibility)** |
| CLO6: Properly set/handle lab infrastructure with safety precautions | PLO\_8 | **P2 (Set)** |
| K6 | Embedded Systems Design | CLO1: Understand different processors and their internal architectures, embedded systems boards. | PLO\_2 | C1 (Understanding) |
| CLO2: Understand and apply software optimization techniques and principles used by compiler and operating system. | PLO\_1 | C3, C4 (Applying& Analyzing) |
| CLO3: Understand memory hierarchy including Cache, Virtual memory. | PLO\_2 | C1 (Understanding) |
| CLO4: Understand input and output peripheries and communication protocols used by embedded systems. | PLO\_2 | C1 (Understanding) |
| CLO5: Analyze selected embedded applications, their design methodologies and terminologies. | PLO\_1 | C3, C4 (Applying& Analyzing) |
| K6 | Power Electronics | CLO1: Be able to **illustrate** the topologies of power electronic circuits for application in controlled rectification, inversion, dc-dc conversion, and ac-ac conversion. | PLO\_2 | C2 |
| CLO2: Be able to **demonstrate** operation and mathematical designing of power electronics circuits. | PLO\_3 | C3 |
| CLO3: Be able to **analyze** the designed circuits for their performance parameters. | PLO\_4 | C4 |
| K6 | Power Electronics Lab | CLO1: Recall the associated concepts form theory regarding various digital logic and signal Conditioning Circuits. | **PLO1** | **C1** (Recall) |
| CLO2: Problem identification, followed by thorough analysis and literature review, resulting in meaningful conclusions | **PLO2** | **C3** (Apply) |
| CLO3: Design/Develop solutions for complex engineering problems, making use of techniques used in labs to design a project. | **PLO3** | **P4** (Mechanism) |
| CLO4: Observe and experimentally validate the working of various sensors, their calibration, and data handling. | **PLO4** | **P3** (Guided Response) |
| CLO5: Properly handle lab infrastructure with safety precautions | **PLO8** | **P2** (Set) |
| CLO6: Assume responsibility and the use of resources to complete the assigned task with proper Teamwork | **PLO9** | **A3(**Assume responsibility**)** |
| K6 | Digital Image Processing | CLO1: Demonstrate a profound knowledge related to image and 2-D signal processing and use their mathematical interpretation | PLO\_1 | C3 |
| CLO2: Apply knowledge of a broad range of image processing techniques including digital image acquisition, formation, manipulation, and develop algorithms for image filtering in spatial and frequency domains, denoising, restoration, color processing, segmentation, and compression | PLO\_1 | C3 |
| CLO3: Evaluate and manipulate various important image processing techniques independently using tools like MATLAB | PLO\_5 | P2 |
| CLO4: Design and categorize algorithms for an image processing system based on given operational, performance and computational requirements for a required application and present them in an effective way | PLO\_3 | C5 |
| K1 | Engineering Physics | CLO1: To understand the fundamental concepts of physical quantities and laws of physics | PLO\_2 | C2 (Understanding) |
| CLO2: To understand the applications of fundamental concepts of physical quantities and laws of physics in daily life | PLO\_1 | C3 (Applying) |
| CLO3: To develop the overall problem solving skills | PLO\_2 | C2 (Understanding) |
| K1 | Engineering Physics Lab | CLO1: Recall the concepts of physics and understand different types of instruments as Viscometer, Spherometer, Pendulum, Flywheel etc. Moreover, familiarize students with basic measuring equipment i.e. Vernier caliper, screw gauge, Ammeter, Voltmeter and their errors. | PLO\_1 | C1 (Recall) |
| CLO2: Observe the behavior of different instruments such as photocell, spherometer magnet, resistor, etc. and calculate the corresponding values. | PLO\_2 | P1 (Observe) |
| CLO3: Effectively present the subject knowledge on the project assigned. | PLO\_3 | P4 (Construct) |
| CLO4: Assume responsibility and the use of resources to complete the assigned task with proper Teamwork | PLO9 | A3(Assume responsibility) |
| CLO5: Properly handle lab infrastructure with safety precautions | PLO8 | P2 (Set) |
| K2 | Calculus | **CLO1: Apply** the concept of functions, Graph, limit, continuity and basic rules of derivatives. | PLO\_1 | C3 (Applying) |
| **CLO2: Apply** the derivatives as slop, tangent, normal and extreme values. Introduction to Series. Introduction toindefinite integrals and techniques of integration | PLO\_1 | C3 (Applying) |
| **CLO3: Apply the** techniques of Definite integrals, Compute length of curves / area of region / volume of solid…  Partial derivatives | PLO\_1 | C3 (Appling ) |
| K2 | Linear Algebra | CLO1: Introduction to complex numbers, polar and exponential form, Demoivre’s theorem, Solution of system of equation, Gauss Jordon method, Gauss Elemination method, Matrix inversion method, LU factorization method, Introduction to matrices and determinants, Matrix transformation,Linear transformation. | PLO\_1 | C3 (Applying) |
| CLO2: Cramer’s Rule, Homogenous system of equation, rank, vectors, Span, linearly dependent and independent vectors, Vector spaces, Subspaces, Null Space , Column Space, Basis and dimension’ | PLO\_1 | C4 (Analyzing) |
| CLO3: Eigenvalues and Eigenvectors, Inner products, Orthogonality, Orthogonal sets, Orthogonal Projections, Gram-schmidt process, Evaluate the problems related with engineering. | PLO\_1 | C5 (Evaluating) |
| K2 | Differential Equations and Transformations | **CLO1: Apply** the basic methods of first and second order of differential equations. | PLO\_1 | C3 (Applying) |
| **CLO2: Apply** the techniques of Laplace transformation , Inverse Laplace Transformation on differential equations. | PLO\_1 | C3 (Applying) |
| **CLO3: Apply** the techniques of Foureior Transformation and Foureir Series on different problems and the basic methods use to solve the Partial Differential Equations. | PLO\_1 | C3 (Applying) |
| K2 | Complex Variable & Multivariable Calculus | **CLO1: Apply** the properties of multivariable vector valued and complex functions. Introduction to Multivariable integration(Line integral) | PLO\_1 | C3 (Applying) |
| **CLO2: Apply** the techniques of multivariable and complex variable in double & Triple Integration . (Green’s Theorem , Stokes theorem & Gauss Divergence theorem) | PLO\_1 | C3 (Applying) |
| **CLO3: Apply** the techniques of multivariable and complex variable on Contour Integration, Cauchy integral formula. Residue theorem | PLO\_1 | C3 (Applying) |
| K2 | Numerical Methods | CLO1: Apply the basic techniques for solving nonlinear equations and system of equations. Introduction to interpolation with difference. | PLO\_1 | C3 (Applying) |
| CLO2: Apply the concept of curve fitting, Differentiation and integration. | PLO\_1 | C3 (Applying) |
| CLO3: Apply the basic techniques for solving first order linear ODEs | PLO\_1 | C3 (Applying) |
| K7 | Engineering Project Management | CLO1: Be able to understand the unique nature of projects as per PMIs definition, learn project life cycle, process groups, WBS, and resources. | PLO\_1 | C2 |
| CLO2: Be able to learn and apply various tools for measuring project performance. | PLO\_5 | C3 |
| CLO3: Be able to understand various techniques for analyzing project performance. | PLO\_11 | C4 |
| K7 | Technology Entrepreneurship | CLO1: To induce knowledge of Entrepreneurship game, and develop a mindset to generate ideas. Be able to identify (C1) and state (C2) a problem faced by the industry. Describe business idea using various TE frameworks and methodologies. Describe (C1) BMC and translate (C2) into a ‘Business Plan’. | PLO\_3  Emphasis Level: 3 | C1, C2 |
| CLO2: Be able to explain (C2) various tools, such as, SWOT analysis, Quick ratio, Balance Sheet, P&L Statements, Cash Flow burn rate and choose (C3) prediction and modeling tools to develop BMC and basic Business Plan and pitch the idea of virtual startup to acquire funding through effective communication. | PLO\_10  Emphasis Level: 2  [This PLO will be covered by CEP] | C2, C3 |
| CL03: Be able to choose (C4) and apply (C3) the appropriate tools as mentioned in CLO2 above for sustainable development to keep pace with the changing times by modifying (C4) the existing prototype to meet the needs of the society in the short and long term. | PLO\_7 Emphasis Level: 1 | C3, C4 |
| K7 | Leadership & Motivation | CLO1: Be able to discover, associate and apply the concepts of leadership and motivation for lifelong learning. | PLO\_12  (Emphasis Level: 1) | C2, C3  (Understanding, Applying) |
| CLO2: Be able to acquire the skill of self-refraction and self-analysis and transform one and others into actual human beings. | PLO\_2  (Emphasis Level: 2) | C4  (Analyzing) |
| CLO3: Be able to harness the potential of team building, through motivation and setting practical examples, and reaping the benefits of working in a team for lifelong learning to meet the challenges of working in today’s fast paced, dynamic work environment. | PLO\_9  (Emphasis Level: 3) | C1, C6  (Remember, Create) |
| K7 | Community Service | CLO1: Be able to understand (C2) the issues being faced by the have-nots adding fuel to the problems of the society and cause of discord among various sections of the society. | PLO\_6  Emphasis Level: 2 | C2 |
| CLO2: Upon identification of the social malaise of the society, be able to apply (C3) the class learning, to resolve the social issues by practically engaging in social work through NGOs and get the feel of social responsibility through social project as assigned by the class teacher. | PLO\_9  Emphasis Level: 3 | C3 |
| CLO3: Be able to support the cause of social service by analyzing (C4) the impact of global warming and appraise the community to respect the environment for the sustainable development of the society in the long run. | PLO\_7  Emphasis Level: 2 | C4 |
| K7 | Professional & Social Ethics | CLO1: Identify (C1) the need for learning ethics, compare (C2) and contrast (C2) the concepts learned and differentiate between right & wrong to transform self. | PLO\_8  Emphasis Level: 3 | C1, C2 |
| CLO2: Be an agent of change (C3) by practicing the concepts learned and demonstrate (C3) the benefits of ethics by applying (C3) them in the work place to meet his/her obligation as a Professional Engineer specifically the environment in the wake of global warming for sustainable development. | PLO\_7  Emphasis Level: 1 | C3 |
| CLO3: Be able to analyze (C4) and evaluate (C5) an ethical dilemma and decide (C5) its impact on the organization and society and make decisions in the larger interest of the society by debating, defending (C5) and justifying the decision so made. | PLO\_10  Emphasis Level: 2 | C4, C5 |
| K7 | Pakistan & Islamic Studies | CLO1: To comprehend the history, culture, geography, environment and development of Pakistan, and the fundamental principles and basic concepts of Islam. | PLO\_8 | C2  (Understanding) |
| CLO2: To apply CLO 1 to analyze the issues Pakistan is facing and to become a better human being. | PLO\_12 | C3  (Applying) |
| CLO3: To evaluate internal and external problems Pakistan is facing | PLO\_2 | C5  (Evaluating) |
| K5 | Proficiency Development (English I) | CLO1: To comprehend different aspects of generative grammar and productive and receptive skills in English language | PLO\_10 | C2  (Understanding) |
| CLO2: To apply CLO 1 in productive and receptive skills in English language. | PLO\_12 | C3  (Applying) |
| CLO3: To create a meaningful text in English | PLO\_06 | C6  (Creating) |
| K5 | Public Speaking (English II) | CLO1: To comprehend different aspects of public speaking using English | PLO\_10 | C2  (Understanding) |
| CLO2: To apply CLO 1 in the spoken productive skill using English. | PLO\_12 | C3  (Applying) |
| CLO3: To create a meaningful spoken text in English. | PLO\_6 | C6  (Creating) |
| K5 | Official Communication & Report Writing (English III) | CLO1: To develop accuracy and expression. | PLO\_10 | C2  (Understanding) |
| CLO2: To develop the art of effective persuasive arguments | PLO\_06 | C3  (Applying) |
| CLO3: To be well apprised of forms & formats of correspondence | PLO\_12 | C6  (Creating) |

# ANNEXURE-B1 (Employer Survey)

****

**PAF Karachi Institute of Economics & Technology  
Main Campus, Korangi Creek Road, Karachi 74160**[**www.pafkiet.edu.pk**](http://www.pafkiet.edu.pk)

**Employer Survey**

The purpose of this survey is to obtain employers' input on the quality of education that Pakistan Air Force-Karachi Institute of Economics & Technology (PAF-KIET) is providing and to assess the quality of our academic programs. The survey is with regard to the institute graduates employed at your organization. We seek your help in completing this survey. Kindly **Bold/Circle** related answer.

5: Excellent 4: Very good 3: Good 2: Fair 1: Poor

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **I** | **Knowledge** | | | | | | |
|  | **A.** | Technical Knowledge | (5) | (4) | (3) | (2) | (1) |
|  | **B.** | Problem formulation and solving skills | (5) | (4) | (3) | (2) | (1) |
|  | **C.** | Collecting and analyzing appropriate data | (5) | (4) | (3) | (2) | (1) |
|  | **D.** | Ability to link theory to Practice | (5) | (4) | (3) | (2) | (1) |
|  | **E.** | Ability to design process | (5) | (4) | (3) | (2) | (1) |
|  | **F.** | Computer knowledge | (5) | (4) | (3) | (2) | (1) |
| **II.** | **Communication Skills** | | | | | | |
|  | **A.** | Oral communication | (5) | (4) | (3) | (2) | (1) |
|  | **B.** | Report writing | (5) | (4) | (3) | (2) | (1) |
|  | **C.** | Presentation skills | (5) | (4) | (3) | (2) | (1) |
| **III** | **Interpersonal Skills** | | | | | | |
|  | **A.** | Ability to work in teams | (5) | (4) | (3) | (2) | (1) |
|  | **B.** | Leadership | (5) | (4) | (3) | (2) | (1) |
|  | **C.** | Independent thinking | (5) | (4) | (3) | (2) | (1) |
|  | **D.** | Motivation | (5) | (4) | (3) | (2) | (1) |
|  | **E.** | Reliability | (5) | (4) | (3) | (2) | (1) |
|  | **F.** | Appreciation of ethical values | (5) | (4) | (3) | (2) | (1) |
| **IV** | **Work Skills** | | | | | | |
|  | **A.** | Time management skills | (5) | (4) | (3) | (2) | (1) |
|  | **B.** | Judgment | (5) | (4) | (3) | (2) | (1) |
|  | **C.** | Discipline | (5) | (4) | (3) | (2) | (1) |
| **V** | **General Comments**  (Please make any additional comments or suggestions, which you think would help strengthen our programs for the preparation of graduates who will enter your field. Did you know as to what to expect from graduates? | | | | | | |
| **VI** | **Kindly provide following information:**  PAF-KIET Graduate Name:  Student ID at PAF-KIET:  Degree earned at PAF-KIET (e.g. BBA/BE/BS etc.):  Organization Name:  Employer Name & Email ID:  Type of Business/ Industry:  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Sign & Stamp | | | | | | |

# ANNEXURE-B2 (Intern Survey Form)

**** **PAF Karachi Institute of Economics & Technology  
Main Campus, Korangi Creek Road, Karachi 74160**[**www.pafkiet.edu.pk**](http://www.pafkiet.edu.pk)

**Internship Evaluation Form**

|  |
| --- |
| **Confidential: Not to be shown to the Internee** |

|  |  |  |
| --- | --- | --- |
| **Name of Internee:** |  | |
| **Company name:** |  | |
| **Duration of Internship** | **From:** | **To:** |
| **No. of days:** | **Absent:** | **Late:** |
| **Department in which internship was served:** |  | |

The purpose of this survey is to obtain employer’s input on the quality of education internee received and the level of preparation they had at PAF-KIET. The purpose of this survey is to assess the quality of the academic programs. We seek your help in completing this survey. Kindly **Bold/Circle** related answer.

5: Excellent 4: Very good 3: Good 2: Fair 1: Poor

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Please rate how the engineering program helped the Internee to develop the following abilities | | | | | | |
| 1. | Ability to apply engineering knowledge to solve complex real world problems | (5) | (4) | (3) | (2) | (1) |
| 2. | Ability to apply fundamentals of engineering sciences for problem identification thorough analysis and literature review | (5) | (4) | (3) | (2) | (1) |
| 3. | Ability to design a system or process that meets requirements within real-world constraints | (5) | (4) | (3) | (2) | (1) |
| 4. | Ability to investigate complicated engineering problems through a systematic approach such as literature review, design and conduct experiments, analysis | (5) | (4) | (3) | (2) | (1) |
| 5. | Ability to apply appropriate modern engineering tools & techniques essential for engineering practice | (5) | (4) | (3) | (2) | (1) |
| 6. | Ability to comprehend and perceive the impact of engineering solutions in a global, economic, environmental and societal context. | (5) | (4) | (3) | (2) | (1) |
| 7. | Ability to understand the impact of engineering solutions in a global, societal & environmental context and demonstration knowledge for sustainable development | (5) | (4) | (3) | (2) | (1) |
| 8. | Ability to understand ethical and professional responsibilities | (5) | (4) | (3) | (2) | (1) |
| 9. | Ability to work effectively as an individual on in a team | (5) | (4) | (3) | (2) | (1) |
| 10. | An ability to communicate effectively using written and verbal skills | (5) | (4) | (3) | (2) | (1) |
| 11. | An ability to demonstrate project management skills in a multidisciplinary environment | (5) | (4) | (3) | (2) | (1) |
| 12 | Ability to identify the needs for technological development and to engage in life-long learning | (5) | (4) | (3) | (2) | (1) |
|  | **General Comments:**  (Please make any additional comments or suggestions, which you think would help strengthen our programs. Also list any new skill-set that you would recommend to help our graduates perform better in the industry | | | | | |

|  |  |
| --- | --- |
| Name of Evaluator |  |
| Designation |  |
| Contact Number |  |
| Email Address |  |

|  |  |
| --- | --- |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Signature of Evaluator with stamp | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date |

|  |
| --- |
| Thank you for providing us internship opportunity in your prestigious organization. After filling this form, kindly send us in a sealed envelope to maintain confidentiality of the feedback to the following address:  Corporate Relations Department, PAF-KIET (Main Campus), PAF Base, Korangi Creek Road, Karachi.  You may also email the scan copy of this document to: [shaheer@pafkiet.edu.pk](mailto:shaheer@pafkiet.edu.pk) |

# ANNEXURE-B3 (Alumni Survey)

**** **PAF Karachi Institute of Economics & Technology  
Main Campus, Korangi Creek Road, Karachi 74160**[**www.pafkiet.edu.pk**](http://www.pafkiet.edu.pk)

**Alumni Survey**

The purpose of this survey is to obtain alumni input on the quality of education they received and the level of preparation they had at PAF-KIET. The purpose of this survey is to assess the quality of the academic programs. We seek your help in completing this survey. Kindly **Bold/Circle** related answer.

5: Excellent 4: Very good 3: Good 2: Fair 1: Poor

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Alumni Information**  Program:  Year of graduation: | | | | | | |
| **1.** | **Knowledge** | | | | | | |
|  | **The program is effective in developing:** | |  |  |  |  |  |
|  | **a.** | Technical Knowledge | (5) | (4) | (3) | (2) | (1) |
|  | **b.** | Problem formulation and solving skills | (5) | (4) | (3) | (2) | (1) |
|  | **c.** | Collecting and analyzing appropriate data | (5) | (4) | (3) | (2) | (1) |
|  | **d.** | Ability to link theory to practice | (5) | (4) | (3) | (2) | (1) |
|  | **e.** | Ability to design a system component or process | (5) | (4) | (3) | (2) | (1) |
|  | **f.** | Computer knowledge | (5) | (4) | (3) | (2) | (1) |
| **2.** | **Communication Skills** | | | | | | |
|  | **The program is effective in enhancing:** | |  |  |  |  |  |
|  | **a.** | Oral communication | (5) | (4) | (3) | (2) | (1) |
|  | **b.** | Report writing | (5) | (4) | (3) | (2) | (1) |
|  | **c.** | Presentation skills | (5) | (4) | (3) | (2) | (1) |
| **3.** | **Interpersonal Skills** | | | | | | |
|  | **The program is effective in enhancing:** | |  |  |  |  |  |
|  | **a.** | Ability to work in teams | (5) | (4) | (3) | (2) | (1) |
|  | **b.** | Independent thinking | (5) | (4) | (3) | (2) | (1) |
|  | **c.** | Appreciation of ethical values | (5) | (4) | (3) | (2) | (1) |
|  | **d.** | Professional development | (5) | (4) | (3) | (2) | (1) |
| **4.** | **Work Skills** | | | | | | |
|  | **The program is effective in enhancing:** | |  |  |  |  |  |
|  | **a.** | Time management skills | (5) | (4) | (3) | (2) | (1) |
|  | **b.** | Judgment | (5) | (4) | (3) | (2) | (1) |
|  | **c.** | Discipline | (5) | (4) | (3) | (2) | (1) |
| **5.** | **General Comments**  (Please make any additional comments or suggestions, which you think would help strengthen our programs. New courses that you would recommend and courses that you did not gain much from) | | | | | | |

# ANNEXURE-B4 (Graduating Student Survey)

**** **PAF Karachi Institute of Economics & Technology  
Main Campus, Korangi Creek Road, Karachi 74160**[**www.pafkiet.edu.pk**](http://www.pafkiet.edu.pk)

**Graduating Students Survey**

The purpose of this survey is to obtain graduating students input on the quality of education they received and the level of preparation they had at PAF-KIET. The purpose of this survey is to assess the quality of the academic programs. We seek your help in completing this survey. Kindly **Bold/Circle** related answer.

5: Excellent 4: Very good 3: Good 2: Fair 1: Poor

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Student / Alumni Information**  Program: Year of graduation: | | | | | |
|  | Please rate how the engineering program helped you to develop the following abilities | | | | | |
| 1. | Ability to apply engineering knowledge to solve complex real world problems | (5) | (4) | (3) | (2) | (1) |
| 2. | Ability to apply fundamentals of engineering sciences for problem identification thorough analysis and literature review | (5) | (4) | (3) | (2) | (1) |
| 3. | Ability to design a system or process that meets requirements within real-world constraints | (5) | (4) | (3) | (2) | (1) |
| 4. | Ability to investigate complicated engineering problems through a systematic approach such as literature review, design and conduct experiments, analysis | (5) | (4) | (3) | (2) | (1) |
| 5. | Ability to apply appropriate modern engineering tools & techniques essential for engineering practice | (5) | (4) | (3) | (2) | (1) |
| 6. | Ability to comprehend and perceive the impact of engineering solutions in a global, economic, environmental and societal context. | (5) | (4) | (3) | (2) | (1) |
| 7. | Ability to understand the impact of engineering solutions in a global, societal & environmental context and demonstration knowledge for sustainable development | (5) | (4) | (3) | (2) | (1) |
| 8. | Ability to understand ethical and professional responsibilities | (5) | (4) | (3) | (2) | (1) |
| 9. | Ability to work effectively as an individual on in a team | (5) | (4) | (3) | (2) | (1) |
| 10. | An ability to communicate effectively using written and verbal skills | (5) | (4) | (3) | (2) | (1) |
| 11. | An ability to demonstrate project management skills in a multidisciplinary environment | (5) | (4) | (3) | (2) | (1) |
| 12 | Ability to identify the needs for technological development and to engage in life-long learning | (5) | (4) | (3) | (2) | (1) |
|  | **General Comments**  (Please make any additional comments or suggestions, which you think would help strengthen our programs. New courses that you would recommend and courses that you did not gain much from) | | | | | |

# ANNEXURE-C1 (System of Instruction and Examination)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Nature of Academic Sessions:** | **a) Annual** | **b) Term** | **c) Semester** | **d) Quarter** |
| **No. of sessions in the Program (4/8/8/12)** | 8 Regular semesters (Fall/Spring) and 4 summer semesters |  |  |  |
| **Duration of a session (in weeks)** | **17** |  | **15** |  |
| **Total No. of courses in the Program:** |  |  |  |  |
| **No. of courses in a session:** | **5** |  | **6** |  |
| **Total contact-hours for a Theory course per session:** | 45 contact hours per semester for 3 CH theory course |  |  |  |
| **Total contact-hours for a Practical course per session:** | 45 contact hours per semester for 1 CH lab course |  |  |  |
| **Weekly contact-hours for a Theory class:** | 3 contact hours in a week for 3 CH theory course |  |  |  |
| **Weekly contact-hours for a Practical class:** | 3 contact hours in a week for 1 CH lab course |  |  |  |
| **Attach Academic Calendars (for Current & the Previous years):** |  | Attached |  |  |
| **Attach Grade-Sheets for LAST ONE-year (All Batches) as per the following format):** |  | Attached |  |  |

# ANNEXURE-C2 (Grade Sheets)

**Grade-Sheet**

Intake Batch: FA-17, SP-18

**Session (Term**/**Semester**/**Year):**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **BE Mechatronics Spring-2014(VIII Semester)** | | | | | | | | | | |
|  |  | **No of students securing grades(or%age ranges, i.e.<40,**  **40-50, 50-60, 60-70, 70-80, 80-90,> 90)** | | | | | | | | | |
| Course  Code | Course Name | Total | A+ | A | B+ | B | C+ | C | D+ | D | F |
| EE4422 | Robotics | 25 | 0 | 5 | 10 | 4 | 3 | 1 | 0 | 1 | 1 |
| Robotics Lab | 25 | 0 | 13 | 2 | 1 | 1 | 4 | 0 | 3 | 1 |
| MG4302 | Technology Entrepreneurship | 20 | 0 | 7 | 5 | 1 | 2 | 2 | 0 | 2 | 1 |
| ME3307 | Fundamentals of Thermal  Sciences Lab | 28 | 0 | 10 | 3 | 6 | 4 | 4 | 0 | 0 | 1 |
| DP4302 | SDP II | 21 | 0 | 5 | 10 | 1 | 3 | 0 | 0 | 2 | 0 |
| HS3305 | English III (Official  Communication and Report  Writing) | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| HS3306 | Pakistan and Islamic Studies | 13 | 0 | 2 | 6 | 5 | 0 | 0 | 0 | 0 | 0 |
|  | **BE Mechatronics Spring-2015(VI Semester)** | | | | | | | | | | |
|  |  | **No.of students securing grades(or%age ranges, i.e.<40,**  **40-50, 50-60, 60-70, 70-80, 80-90,> 90)** | | | | | | | | | |
| EE3327 | Power Electronics | 16 | 0 | 2 | 3 | 3 | 3 | 3 | 0 | 1 | 1 |
| Power Electronics Lab | 18 | 0 | 7 | 8 | 3 | 0 | 0 | 0 | 0 | 0 |
|  | Machine Design | 25 | 0 | 4 | 1 | 4 | 6 | 3 | 0 | 6 | 1 |
| EE3306 | Instrumentation and  Measurement | 23 | 0 | 5 | 5 | 5 | 3 | 3 | 0 | 2 | 0 |
| Instrumentation and  Measurement Lab | 22 | 0 | 14 | 7 | 1 | 0 | 0 | 0 | 0 | 0 |
| ME3408 | Fluid Mechanics | 30 | 0 | 3 | 3 | 6 | 4 | 8 | 0 | 1 | 5 |
| Fluid Mechanics Lab | 27 | 0 | 13 | 10 | 3 | 0 | 0 | 0 | 0 | 1 |
|  | SDP Zero | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| MG3301 | Engineering Project Management | 24 | 0 | 2 | 2 | 7 | 3 | 4 | 0 | 6 | 0 |
| MS3306 | Probability Methods in  Engineering | 21 |  | 10 | 4 | 2 | 2 | 1 | 0 | 2 | 0 |
|  | **BE Mechatronics Spring-2016(IV Semester)** | | | | | | | | | | |
|  |  | **No.of students securing grades(or%age ranges, i.e.<40,**  **40-50, 50-60, 60-70, 70-80, 80-90,> 90)** | | | | | | | | | |
| ME2311 | Linear Systems Modeling | 34 | 0 | 15 | 4 | 5 | 5 | 4 | 0 | 0 | 1 |
| MS2305 | Complex Variables and  Multivariable Calculus | 12 | 0 | 4 | 1 | 0 | 1 | 2 | 0 | 0 | 4 |
| EE2425 | Electrical Machines | 25 | 0 | 2 | 6 | 3 | 3 | 5 | 0 | 2 | 4 |
| Electrical Machines Lab | 19 | 0 | 9 | 6 | 2 | 1 | 0 | 0 | 0 | 1 |
| EE3405 | Linear Integrated Circuits and  Applications | 18 | 0 | 4 | 5 | 4 | 1 | 2 | 0 | 1 | 1 |
| Linear Integrated Circuits and  Applications Lab | 17 | 0 | 15 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| ME2310 | Materials & Manufacturing  Processes | 30 | 0 | 8 | 3 | 7 | 0 | 3 | 0 | 5 | 4 |
|  | **BE Mechatronics Spring-2017(II Semester)** | | | | | | | | | | |
|  |  | **No.of students securing grades(or%age ranges, i.e.<40,**  **40-50, 50-60, 60-70, 70-80, 80-90,> 90)** | | | | | | | | | |
| MS1303 | Calculus | 17 | 0 | 5 | 1 | 2 | 2 | 1 | 0 | 1 | 5 |
| HS1101 | Leadership and Motivation | 15 | 0 | 0 | 4 | 5 | 4 | 1 | 0 | 0 | 1 |
| EE1407 | Digital Logic Fundamentals | 18 | 0 | 3 | 4 | 0 | 2 | 3 | 0 | 1 | 5 |
| Digital Logic Fundamentals Lab | 18 | 0 | 6 | 3 | 3 | 1 | 2 | 0 | 1 | 2 |
| EE2403 | Fundamentals of Electronics | 8 | 0 | 5 | 1 | 2 | 0 | 0 | 0 | 0 | 0 |
| Fundamentals of Electronics Lab | 8 | 0 | 4 | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| ME1204 | Engineering Statics | 17 | 0 | 4 | 1 | 4 | 1 | 3 | 0 | 1 | 3 |
| HS1303 | English I (Proficiency  Development) | 19 | 0 | 0 | 2 | 2 | 2 | 3 | 0 | 8 | 2 |
|  | **BE Mechatronics Spring-2018(I Semester)** | | | | | | | | | | |
|  |  | **No.of students securing grades(or%age ranges, i.e.<40,**  **40-50, 50-60, 60-70, 70-80, 80-90,> 90)** | | | | | | | | | |
| ME1102 | Workshop Technology | 36 | 0 | 12 | 10 | 6 | 4 | 0 | 0 | 0 | 4 |
| MS1303 | Calculus | 40 | 0 | 4 | 5 | 3 | 3 | 3 | 0 | 8 | 14 |
| EE1401 | Linear Circuit Analysis | 37 | 0 | 9 | 6 | 5 | 2 | 0 | 0 | 8 | 7 |
| Linear Circuit Analysis Lab | 37 | 0 | 5 | 9 | 8 | 4 | 3 | 0 | 4 | 4 |
| MS1401 | Engineering Physics | 37 | 0 | 3 | 2 | 8 | 5 | 4 | 0 | 7 | 8 |
| Engineering PhysicsLab | 37 | 0 | 7 | 13 | 9 | 2 | 1 | 0 | 0 | 5 |
| CS1301 | Introduction to Computer  Programming | 37 | 0 | 6 | 3 | 1 | 4 | 7 | 0 | 6 | 10 |
| Introduction to Computer  Programming Lab | 37 | 0 | 8 | 6 | 4 | 6 | 4 | 0 | 1 | 8 |
| HS1102 | Community Service | 38 | 0 | 22 | 11 | 1 | 0 | 0 | 0 | 0 | 4 |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **BE Mechatronics Spring-2017(III Semester)** | | | | | | | | | | | |
|  | | **No.of students securing grades(or%age ranges, i.e.<40,**  **40-50, 50-60, 60-70, 70-80, 80-90,> 90)** | | | | | | | | | |
| Course  Code | Course Name | Total | A+ | A | B+ | B | C+ | C | D+ | D | F |
| EE2404 | Electronic Circuit Design | 9 | 0 | 1 | 3 | 4 | 0 | 1 | 0 | 0 | 0 |
| Electronic Circuit Design Lab | 9 | 0 | 3 | 4 | 2 | 0 | 0 | 0 | 0 | 0 |
| HS2304 | English II (Public Speaking) | 25 | 0 | 1 | 11 | 8 | 3 | 1 | 0 | 1 | 0 |
| ME2201 | Engineering Drawing | 23 | 0 | 10 | 6 | 1 | 3 | 1 | 0 | 1 | 1 |
| Engineering Drawing Lab | 22 | 0 | 6 | 6 | 2 | 1 | 2 | 0 | 2 | 3 |
| ME2205 | Engineering Dynamics | 19 | 0 | 2 | 2 | 3 | 2 | 6 | 0 | 2 | 2 |
| EE2302 | Electrical Network Analysis | 20 | 0 | 4 | 4 | 2 | 1 | 0 | 0 | 2 | 7 |
| MS1304 | Differential Equations and  Transforms | 18 | 0 | 1 | 5 | 2 | 2 | 0 | 0 | 5 | 3 |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **BE Mechatronics Spring-2016(V Semester)** | | | | | | | | | | |
|  |  | **No. of students securing grades(or%age ranges, i.e.<40,**  **40-50, 50-60, 60-70, 70-80, 80-90,> 90)** | | | | | | | | | |
| Course  Code | Course Name | Total | A+ | A | B+ | B | C+ | C | D+ | D | F |
| EE3417 | Microcontroller based Systems | 30 | 0 | 7 | 18 | 1 | 1 | 1 | 0 | 0 | 2 |
| Microcontroller based Systems  Lab | 25 | 0 | 8 | 6 | 5 | 4 | 0 | 0 | 1 | 1 |
| ME3307 | Fundamentals of Thermal  Sciences | 26 | 0 | 6 | 3 | 5 | 5 | 4 | 0 | 3 | 0 |
| Fundamentals of Thermal  Sciences Lab | 28 | 0 | 24 | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| EE3411 | Linear Control Systems | 24 | 0 | 1 | 4 | 5 | 4 | 2 | 0 | 4 | 4 |
| Linear Control Systems Lab | 24 | 0 | 11 | 3 | 6 | 3 | 1 | 0 | 0 | 0 |
| ME2309 | Mechanics of Materials | 25 | 0 | 3 | 8 | 3 | 1 | 5 | 0 | 3 | 2 |
| ME3326 | Theory of Machines | 27 | 0 | 3 | 6 | 4 | 4 | 4 | 0 | 4 | 2 |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **BE Mechatronics Spring-2015(VII Semester)** | | | | | | | | | | |
|  |  | **No.of students securing grades(or%age ranges, i.e.<40,**  **40-50, 50-60, 60-70, 70-80, 80-90,> 90)** | | | | | | | | | |
| Course  Code | Course Name | Total | A+ | A | B+ | B | C+ | C | D+ | D | F |
| ME4314 | Mechatronic Systems Design | 22 | 0 | 5 | 9 | 8 | 0 | 0 | 0 | 0 | 0 |
| Mechatronic Systems Design Lab | 22 | 0 | 13 | 9 | 0 | 0 | 0 | 0 | 0 | 0 |
| ME3307 | Fundamentals of Thermal  Sciences Lab | 22 | 0 | 5 | 16 | 1 | 0 | 0 | 0 | 0 | 0 |
| EE4321 | Industrial Control and  Automation | 27 | 0 | 11 | 11 | 1 | 1 | 3 | 0 | 0 | 0 |
| Industrial Control and  Automation Lab | 25 | 0 | 4 | 4 | 2 | 6 | 2 | 0 | 5 | 2 |
| EE4313 | Sensors & Actuators | 25 | 0 | 3 | 2 | 5 | 4 | 6 | 0 | 4 | 1 |
| Sensors & Actuators Lab | 25 | 0 | 12 | 9 | 4 | 0 | 0 | 0 | 0 | 0 |
| MS4307 | Numerical Methods | 31 | 0 | 17 | 9 | 2 | 1 | 0 | 0 | 0 | 2 |
| HS4206 | Technology Entrepreneurship | 13 | 0 | 1 | 3 | 6 | 1 | 0 | 0 | 1 | 1 |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **BE Mechatronics Spring-2019 (IV Semester)** | | | | | | | | | | |
|  |  | **No. of students securing grades (or%age ranges, i.e.<40,**  **40-50, 50-60, 60-70, 70-80, 80-90,> 90)** | | | | | | | | | |
| Course  Code | Course Name | Total | A+ | A | B+ | B | C+ | C | D+ | D | F |
| EE2209 | Signals and Systems | 12 | 0 | 0 | 1 | 2 | 1 | 2 | 0 | 3 | 2 |
| MS2305 | Complex Variables and  Multivariable Calculus | 23 | 0 | 2 | 14 | 5 | 1 | 0 | 0 | 0 | 0 |
| EE2425 | Electrical Machines | 26 | 0 | 7 | 7 | 3 | 1 | 6 | 0 | 1 | 0 |
| Electrical Machines Lab | 25 | 0 | 9 | 7 | 5 | 2 | 0 | 0 | 0 | 2 |
| EE3405 | Linear Integrated Circuits and  Applications | 15 | 0 | 7 | 4 | 1 | 2 | 0 | 0 | 1 | 0 |
| Linear Integrated Circuits and  Applications Lab | 18 | 0 | 13 | 2 | 2 | 1 | 0 | 0 | 0 | 0 |
| ME3408 | Fluid Mechanics | 21 | 0 | 3 | 4 | 4 | 2 | 7 | 0 | 1 | 0 |
| Fluid Mechanics Lab | 21 |  | 14 | 6 |  | 1 |  |  |  |  |

# ANNEXURE-C3 (Academic Calendar)

Table

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Table

Description automatically generated

# ANNEXURE-D (PLO Intensity Charts)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Semester No.** | **Course Code** | **Course Title** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
|  |  |  |  |  |  |  |  |  |  |  |  |
| 1 | EE1401 | Linear Circuit Analysis | 2 | 3 |  |  |  |  |  |  |  |  |  |  |
| EE1401 | Linear Circuit Analysis Lab | 1 | 2 | 2 | 3 | 1 |  |  | 1 | 1 |  |  |  |
| MS1401 | Engineering Physics | 2 | 3 |  |  |  |  |  |  |  |  |  |  |
| MS1401 | Engineering Physics Lab | 1 | 2 | 1 |  |  |  |  | 1 | 1 |  |  |  |
| CS1301 | Introduction to Computer Programming | 3 |  |  |  |  |  |  |  |  |  |  | 1 |
| CS1301 | Introduction to Computer Programming Lab | 1 | 1 | 3 |  | 2 |  |  | 1 | 1 |  |  |  |
| MS1302 | Calculus | 1 | 1 | 1 |  |  |  |  |  |  |  |  |  |
| ME1102 | Workshop Technology | 1 |  | 1 |  | 3 |  |  | 2 | 1 |  |  |  |
| HS1102 | Community Service |  |  |  |  |  | 2 | 2 |  | 3 |  |  |  |
| 2 | MS1303 | Linear Algebra | 1 | 1 | 1 |  |  |  |  |  |  |  |  |  |
| EE2403 | Fundamentals of Electronics | 2 | 2 | 1 |  |  |  |  |  |  |  |  |  |
| EE2403 | Fundamentals of Electronics Lab | 1 | 1 | 1 | 3 | 2 |  |  | 1 | 1 |  |  |  |
| HS1101 | Leadership and Motivation |  | 2 |  |  |  |  |  |  | 3 |  |  | 1 |
| EE1407 | Digital Logic Fundamentals | 2 | 2 |  |  |  |  |  |  |  |  |  |  |
| EE1407 | Digital Logic Fundamentals Lab | 1 | 1 | 3 | 3 | 1 |  |  | 1 | 1 |  |  |  |
| ME1204 | Engineering Statics | 2 | 3 |  |  |  |  |  |  |  |  |  |  |
| ME2201 | Engineering Drawing | 2 |  |  |  | 3 |  |  |  |  |  |  |  |
| 3 | ME2205 | Engineering Dynamics | 2 | 3 |  |  |  |  |  |  |  |  |  |  |
| MS1304 | Differential Equations and Transforms | 1 | 1 | 1 |  |  |  |  |  |  |  |  |  |
| EE2302 | Electrical Network Analysis | 2 | 3 |  |  |  |  |  |  |  |  |  |  |
| EE2404 | Electronic Circuit Design |  | 3 | 1 |  |  |  |  |  |  |  |  |  |
| EE2404 | Electronic Circuit Design Lab | 1 |  | 3 | 2 | 2 |  |  | 1 | 1 |  |  |  |
| HS2304 | English (Public Speaking) |  |  |  |  |  |  |  |  |  | 3 |  |  |
| ME2309 | Mechanics of Materials | 2 | 3 |  |  |  |  |  |  |  |  |  |  |
| 4 | MS2305 | Complex Variables and Multivariable Calculus | 1 | 1 | 1 |  |  |  |  |  |  |  |  |  |
| EE2209 | Signals and Systems | 3 | 2 |  |  |  |  |  |  |  |  |  |  |
| EE3405 | Linear ICs and Applications | 2 |  | 3 |  |  |  |  |  |  |  |  |  |
| EE3405 | Linear ICs and Applications Lab | 1 | 2 | 3 | 1 | 2 |  |  | 1 | 1 |  |  |  |
| ME3408 | Fluid Mechanics | 2 | 3 |  |  |  |  |  |  |  |  |  |  |
| ME3408 | Fluid Mechanics Lab | 1 |  | 2 | 3 |  |  |  | 1 | 1 |  |  |  |
| EE2425 | Electrical Machines | 2 | 3 |  |  |  |  |  |  |  |  |  |  |
| EE2425 | Electrical Machines Lab | 1 | 1 | 2 | 1 | 3 |  |  | 3 | 1 |  |  |  |
| 5 | EE3417 | Microcontroller based Systems | 3 |  | 2 |  |  |  |  |  |  |  |  |  |
| EE3417 | Microcontroller based Systems Lab | 1 | 1 | 3 | 1 | 2 |  |  | 1 |  |  |  |  |
| EE3411 | Linear Control Systems | 2 | 3 | 1 |  |  |  |  |  |  |  |  |  |
| EE3411 | Linear Control Systems Lab | 2 | 1 | 2 | 2 | 3 |  |  | 1 | 1 |  |  |  |
| ME3326 | Theory of Machines |  | 3 |  |  |  |  |  |  |  |  |  |  |
| EE3306 | Instrumentation and Measurement | 3 | 3 |  |  |  |  |  |  |  |  |  |  |
| EE3306 | Instrumentation and Measurement Lab | 2 | 1 | 2 | 1 | 2 |  |  | 1 | 1 |  |  |  |
| ME3307 | Fundamentals of Thermal Sciences | 1 | 1 | 2 |  |  |  |  |  |  |  |  |  |
| ME3307 | Fundamentals of Thermal Sciences Lab | 1 |  | 2 | 3 |  |  |  | 1 | 1 |  |  |  |
| 6 | HS4206 | Professional and Social Ethics |  |  |  |  |  | 1 |  | 3 |  | 2 |  |  |
| ME2310 | Materials and Manufacturing Processes | 1 | 1 |  |  |  |  |  |  |  |  |  |  |
| ME3212 | Machine Design |  | 1 | 1 | 1 |  |  |  |  |  |  |  |  |
| EE3327 | Power Electronics |  | 1 | 1 | 1 |  |  |  |  |  |  |  |  |
| EE3327 | Power Electronics Lab | 1 | 1 | 1 | 2 |  |  |  | 1 | 1 |  |  |  |
| MG3301 | Project Management | 1 |  |  |  | 1 |  |  |  |  |  | 3 |  |
| MS3306 | Probability Methods in Engineering | 1 | 1 | 1 |  |  |  |  |  |  |  |  |  |
| 7 | MTE4314 | Mechatronic System design |  | 2 | 2 |  |  |  |  |  |  |  |  | 1 |
| ME4314 | Mechatronic System design Lab | 1 | 1 | 2 | 3 | 1 |  |  | 1 | 1 |  |  |  |
| ME4320 | Introduction to Robotics |  | 1 |  | 3 |  |  |  |  |  |  |  |  |
| ME4320 | Introduction to Robotics Lab | 1 | 1 | 1 | 2 | 1 |  |  | 1 | 1 |  |  |  |
| EE4321 | Industrial Control and Automation |  | 2 | 1 | 1 |  |  |  |  |  |  |  |  |
| EE4321 | Industrial Control and Automation Lab | 1 | 2 | 3 |  | 2 |  |  | 1 | 1 |  |  |  |
| MTE4313 | Sensors and Actuators |  | 3 | 1 |  |  |  |  |  |  |  |  |  |
| ME4313 | Sensors and Actuators Lab | 1 | 1 | 1 | 2 | 1 |  |  | 1 | 1 |  |  |  |
| DP4301 | SDP-I | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 8 | MG4302 | Technology Entrepreneurship |  |  | 1 |  | 1 |  |  |  |  |  |  | 1 |
| HS3305 | English (Official  Communication and Report  Writing) |  |  |  |  |  |  |  |  |  | 3 |  |  |
| HS3306 | Pakistan and Islamic Studies |  | 1 |  |  |  |  |  | 1 |  |  |  |  |
| MS4307 | Numerical Methods | 3 |  |  |  |  |  |  |  |  |  |  |  |
| MTE4323 | Mobile Robotics | 1 | 1 | 1 |  |  |  |  |  |  |  |  |  |
| DP4302 | SDP-II | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

# ANNEXURE-E (Curriculum Design-Program Structure)

## Curriculum Design SP-17

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Domain | Knowledge Area | PEC/HEC Recommended | | Institute’s Program Breakup | |
|  |  | Total | Overall | Total | Overall |
| Credits | % | Credits | % |
| Non-  Engineering | Humanities | As per discipline specific  NCRC  guidelines | 25% -- 35% | 16 | 31.8% |
| Management Sciences | 6 |
| Natural Sciences | 22 |
| Engineering | Computing | As per discipline specific  NCRC  guidelines | 65% -- 75% | 7 | 68.2% |
| Engineering Foundation | 31 |
| Major Based  Core  (Breadth) | 29 |
| Major Based Core (Depth) | 21 |
| InterDisciplinary  Engineering  Breadth  (Electives) |  |
| Senior  Design  Project | 6 |  | 6 |
| Industrial  Training  (Summer) | 0 |  | 0 |
|  | Total | 130 – 138 | 100% | 0 | 0 |

## Curriculum Design SP-18

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Domain** | **Knowledge Area** | **PEC/HEC Recommended** | | **Institute’s Program Breakup** | |
|  |  | **Total** | **Overall** | **Total** | **Overall** |
| **Credits** | **%** | **Credits** | **%** |
| Non-  Engineering | Humanities | As per discipline specific  NCRC  guidelines | 25% -- 35% | 12 | 28.8% |
| Management Sciences | 6 |
| Natural Sciences | 22 |
| Engineering | Computing | As per discipline specific  NCRC  guidelines | 65% -- 75% | 7 | 71.2% |
| Engineering Foundation | 33 |
| Major Based  Core  (Breadth) | 29 |
| Major Based Core (Depth) | 24 |
| InterDisciplinary  Engineering  Breadth  (Electives) |  |
| Senior  Design  Project | 6 |  | 6 |
| Industrial  Training  (Summer) | 0 |  | 0 |
|  | Total | 130 – 138 | 100% | 0 | 0 |

## Curriculum Design SP-19 SP-20 SP-21

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Domain** | **Knowledge Area** | **PEC/HEC Recommended** | | **Institute’s Program Breakup** | |
|  |  | **Total** | **Overall** | **Total** | **Overall** |
| **Credits** | **%** | **Credits** | **%** |
| Non-  Engineering | Humanities | As per discipline specific  NCRC  guidelines | 25% -- 35% | 12 | 28.57% |
| Management Sciences | 6 |
| Natural Sciences | 22 |
| Engineering | Computing | As per discipline specific  NCRC  guidelines | 65% -- 75% | 7 | 71.43% |
| Engineering Foundation | 34 |
| Major Based  Core  (Breadth) | 29 |
| Major Based Core (Depth) | 24 |
| Inter Disciplinary  Engineering  Breadth  (Electives) |  |
| Senior  Design  Project | 6 |  | 6 |
| Industrial  Training  (Summer) | 0 |  | 0 |
|  | Total | 130 – 138 | 100% | 0 | 0 |

# ANNEXURE-F (Curriculum Design-Coverage of Engineering and Non-Engineering Courses)

## Effective from Spring 2022

### Year 1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Semester I** |  | | | |
| **Course Code** | **Course Title** | **Theory** | **Practical** | **Total** |
| EE1401 | Linear Circuit Analysis | 3 | 1 | 4 |
| MS1401 | Engineering Physics | 3 | 1 | 4 |
| CS1301 | Introduction to Computer Programming | 2 | 1 | 3 |
| MS1303 | Calculus | 3 | 0 | 3 |
| ME1202 | Workshop Technology | 0 | 2 | 2 |
| HS1102 | Community Service | 0 | 1 | 1 |
|  | Total | 11 | 6 | 17 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Semester II** |  | | | |
| **Course Code** | **Course Title** | **Theory** | **Practical** | **Total** |
| MS1302 | Linear Algebra | 3 | 0 | 3 |
| EE2403 | Fundamentals of Electronics | 3 | 1 | 4 |
| HS1101 | Leadership and Motivation | 1 | 0 | 1 |
| EE1407 | Digital Logic Fundamentals | 3 | 1 | 4 |
| ME1204 | Engineering Statics | 3 | 0 | 3 |
| ME2201 | Engineering Drawing | 0 | 2 | 2 |
|  | Total | 13 | 4 | 17 |

### Year 2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Semester III** |  | | | |
| **Course Code** | **Course Title** | **Theory** | **Practical** | **Total** |
| ME2205 | Engineering Dynamics | 3 | 0 | 3 |
| MS1304 | Differential Equations and Transforms | 3 | 0 | 3 |
| EE2302 | Electrical Network Analysis | 3 | 0 | 3 |
| EE2404 | Electronic Circuit Design | 3 | 1 | 4 |
| HS2304 | English (Public Speaking) | 2 | 0 | 3 |
| ME2309 | Mechanics of Materials | 3 | 0 | 3 |
|  | Total | 17 | 1 | 18 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Semester IV** |  | | | |
| **Course Code** | **Course Title** | **Theory** | **Practical** | **Total** |
| MS2305 | Complex Variables and Multivariable Calculus | 3 | 0 | 3 |
| EE2209 | Signals and Systems | 2 | 0 | 2 |
| CS2301 | Data Structure and Object Oriented Programming | 3 | 1 | 4 |
| ME3408 | Fluid Mechanics | 3 | 1 | 4 |
| EE2425 | Electrical Machines | 3 | 1 | 4 |
| ME2301 | Solid Modeling | 0 | 1 | 1 |
|  | Total | 14 | 4 | 18 |

### Year 3

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Semester V** |  | | | |
| **Course Code** | **Course Title** | **Theory** | **Practical** | **Total** |
| EE3417 | Microcontroller based Systems | 3 | 1 | 4 |
| EE3411 | Linear Control Systems | 3 | 1 | 4 |
| ME3326 | Theory of Machines | 3 | 0 | 3 |
| EE3306 | Instrumentation and Measurement | 2 | 1 | 3 |
| ME3307 | Fundamentals of Thermal Sciences | 3 | 1 | 3 |
|  | Total | 14 | 4 | 18 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Semester VI** |  | | | |
| **Course Code** | **Course Title** | **Theory** | **Practical** | **Total** |
| HS4206 | Professional and Social Ethics | 2 | 0 | 2 |
| ME2310 | Materials and Manufacturing Processes | 3 | 0 | 3 |
| MTE3312 | Machine Design | 3 | 0 | 3 |
| EE3327 | Power Electronics | 3 | 1 | 4 |
| MG3301 | Project Management | 3 | 0 | 3 |
| MS3306 | Probability Methods in Engineering | 3 | 0 | 3 |
|  | Total | 17 | 1 | 18 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Semester VIII** |  | | | |
| **Course Code** | **Course Title** | **Theory** | **Practical** | **Total** |
| MG4302 | Technology Entrepreneurship | 3 | 0 | 3 |
| HS3305 | English (Official Communication and Report Writing) | 3 | 0 | 3 |
| HS3306 | Pakistan and Islamic Studies | 3 | 0 | 3 |
| MS4307 | Numerical Methods | 3 | 0 | 3 |
| MTE4321 | Mobile Robotics | 3 | 0 | 3 |
| DP4302 | SDP-II | 0 | 3 | 3 |
|  | Total | 15 | 3 | 18 |

### Year 4

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Semester VII** |  | | | |
| **Course Code** | **Course Title** | **Theory** | **Practical** | **Total** |
| MTE4314 | Mechatronic System design | 2 | 1 | 3 |
| MTE4420 | Introduction to Robotics | 3 | 1 | 4 |
| EE4321 | Industrial Control and Automation | 2 | 1 | 3 |
| MTE4413 | Sensors and Actuators | 3 | 1 | 4 |
| DP4301 | SDP-I | 0 | 3 | 3 |
|  | Total | 10 | 7 | 17 |

## Effective from Spring 2019 till Spring 2021

### Year 1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Semester I** |  | | | |
| **Course Code** | **Course Title** | **Theory** | **Practical** | **Total** |
| EE1401 | Linear Circuit Analysis | 3 | 1 | 4 |
| MS1401 | Engineering Physics | 3 | 1 | 4 |
| CS1301 | Introduction to Computer Programming | 2 | 1 | 3 |
| MS1303 | Calculus | 3 | 0 | 3 |
| ME1202 | Workshop Technology | 0 | 2 | 2 |
| HS1102 | Community Service | 0 | 1 | 1 |
|  | Total | 11 | 6 | 17 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Semester II** |  | | | |
| **Course Code** | **Course Title** | **Theory** | **Practical** | **Total** |
| MS1302 | Linear Algebra | 3 | 0 | 3 |
| EE2403 | Fundamentals of Electronics | 3 | 1 | 4 |
| HS1101 | Leadership and Motivation | 1 | 0 | 1 |
| EE1407 | Digital Logic Fundamentals | 3 | 1 | 4 |
| ME1204 | Engineering Statics | 3 | 0 | 3 |
| ME2201 | Engineering Drawing | 0 | 2 | 2 |
|  | Total | 13 | 4 | 17 |

### Year 2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Semester III** |  | | | |
| **Course Code** | **Course Title** | **Theory** | **Practical** | **Total** |
| ME2205 | Engineering Dynamics | 3 | 0 | 3 |
| MS1304 | Differential Equations and Transforms | 3 | 0 | 3 |
| EE2302 | Electrical Network Analysis | 3 | 0 | 3 |
| EE2404 | Electronic Circuit Design | 3 | 1 | 4 |
| HS2304 | English (Public Speaking) | 2 | 0 | 3 |
| ME2309 | Mechanics of Materials | 3 | 0 | 3 |
|  | Total | 17 | 1 | 18 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Semester IV** |  | | | |
| **Course Code** | **Course Title** | **Theory** | **Practical** | **Total** |
| MS2305 | Complex Variables and Multivariable Calculus | 3 | 0 | 3 |
| EE2209 | Signals and Systems | 2 | 0 | 2 |
| EE3405 | Linear ICs and Applications | 3 | 1 | 4 |
| ME3408 | Fluid Mechanics | 3 | 1 | 4 |
| EE2425 | Electrical Machines | 3 | 1 | 4 |
|  | Total | 14 | 3 | 17 |

### Year 3

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Semester V** |  | | | |
| **Course Code** | **Course Title** | **Theory** | **Practical** | **Total** |
| EE3417 | Microcontroller based Systems | 3 | 1 | 4 |
| EE3411 | Linear Control Systems | 3 | 1 | 4 |
| ME3326 | Theory of Machines | 3 | 0 | 3 |
| EE3306 | Instrumentation and Measurement | 2 | 1 | 3 |
| ME3307 | Fundamentals of Thermal Sciences | 3 | 1 | 3 |
|  | Total | 14 | 4 | 18 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Semester VI** |  | | | |
| **Course Code** | **Course Title** | **Theory** | **Practical** | **Total** |
| HS4206 | Professional and Social Ethics | 2 | 0 | 2 |
| ME2310 | Materials and Manufacturing Processes | 3 | 0 | 3 |
| MTE3312 | Machine Design | 3 | 0 | 3 |
| EE3327 | Power Electronics | 3 | 1 | 4 |
| MG3301 | Project Management | 3 | 0 | 3 |
| MS3306 | Probability Methods in Engineering | 3 | 0 | 3 |
|  | Total | 17 | 1 | 18 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Semester VIII** |  | | | |
| **Course Code** | **Course Title** | **Theory** | **Practical** | **Total** |
| MG4302 | Technology Entrepreneurship | 3 | 0 | 3 |
| HS3305 | English (Official Communication and Report Writing) | 3 | 0 | 3 |
| HS3306 | Pakistan and Islamic Studies | 3 | 0 | 3 |
| MS4307 | Numerical Methods | 3 | 0 | 3 |
| MTE4321 | Mobile Robotics | 3 | 0 | 3 |
| DP4302 | SDP-II | 0 | 3 | 3 |
|  | Total | 15 | 3 | 18 |

### Year 4

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Semester VII** |  | | | |
| **Course Code** | **Course Title** | **Theory** | **Practical** | **Total** |
| MTE4314 | Mechatronic System design | 2 | 1 | 3 |
| MTE4420 | Introduction to Robotics | 3 | 1 | 4 |
| EE4321 | Industrial Control and Automation | 2 | 1 | 3 |
| MTE4413 | Sensors and Actuators | 3 | 1 | 4 |
| DP4301 | SDP-I | 0 | 3 | 3 |
|  | Total | 10 | 7 | 17 |

# ANNEXURE-G1 (Details of Lab Equipment)

**Details of Laboratory Equipment (Dedicated to Mechatronics Engineering)**

|  |  |  |  |
| --- | --- | --- | --- |
| **S**  **No** | **Name of Lab** | **No. of Work Stations** | **Work Station-**  **Students Ratio** |
| **1** | **General Engineering Workshop** | 10 Work Stations comprising:  Drill Press MICRO Brand,  Lathe Machines,  Shaper Machine,  Milling Machine,  Welding Plant,  Square feet scale,  Hand drills,  Hand Tapes,  Drill Wise,  Grinder,  Heat Gun,  Glue Gun,  Blower,  Planner Wood,  Hacksaw Frame,  Wood Cutter Table Saw,  Wood Router machine  Cobbler Pincer,  Sheet Bender,  Knurling Tools,  Hand Tools,  Power Tools,  Mechanic Tools,  Basic Home Wiring Trainer &  Basic Electrical Trainer | See Note Below |
| **2.** | **Robotics Lab** | 08Work Stations comprising:  Intel Core i3 computer System,  Zumo 32U4 Robot,  Lego Mindstorms NXT 2.0,  Lego Mindstorms EV 3,  Inertial Motion Sensors, Robotic Arms Trainers,  Conveyer belt Trainers,  Digital Oscilloscopes,  Function Generators, | See note below |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | Dual Channel Power Supplies & Digital Multi-meters. |  |
| **3.** | **Fluid Mechanics Lab** | 08 Work Stations comprising:  Centrifugal Pump Demonstration Unit,  Bernoulli's Theorem Apparatus,  Energy Losses in Band / Energy Losses in  Pipes,  Flow Meter Measurement, Manometer,  Pipe Friction Apparatus,  Pitot Tube,  Gott-Basic Hydraulic Trainer,  Laminar Unit,  Meta-centric Height Apparatus, Hydrostatic Pressure Apparatus & Impact of Jet Apparatus. | See notes below |
| **4.** | **Fundamentals of Thermal Sciences Lab** | 08 Work Stations comprising:  Refrigerator Trainer,  Temperature Measurement Bench,  Free & Forced Convection,  Perfect Gas Laws,  Radiation Heat Transfer,  Heat Conduction Unit (Linear and Radical),  Heat Exchanger,  Plate Type Heat Exc.,  Shell & Tube Heat Exc, | See notes below |
| **5.** | **Sensors & Actuators Lab** | 08 Work Stations comprising:  Intel Core i3 computer System,  Pneumatic Trainers with Air Compressor,  RIMS DEV-2750 Mini Process Control  Trainers,  Servo and DC Motor Trainers,  Magnetic Levitation System GML 1001,  Linear One Stage Inverted Pendulum System,  Quanser Coupled Tanks,  Ball & Beam Trainer,  Transducer & Instrumentation Trainer,  Process Control Trainer 4 in 1,  Digital Oscilloscopes,  Function Generators,  Dual Channel Power Supplies and  Digital Multimeters | See notes below |
| **6.** | Mechatronics System Design Lab | 08 Work Stations comprising:  Intel Core i5 computer System,  CNC milling machine,  3D printer,  Digital multi meter,  Digital Oscilloscope,  Soldering Station,  Long Nose,  Diagonal Cutter,  Screw driver Set,  De-Soldering Pump,  Storage Cabinets,  Bench Top Power Supply,  Variac Single Phase,  Variac Three Phase,  Energy Meter,  LCR Meter,  Function Generator, ESD safe mate &  ESD Wrist Strap.  Gear Trains | See Notes below |

**Details of Shared Laboratory Equipment**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S**  **No** | **Name of Lab** | **No. of Work Stations** |  | **Work Station-**  **Students Ratio** |
| 1 | **Instrumentation & Data Acquisition Lab** | 08 Work Stations Comprising: Intel Core i3 computer System,  Micro Computer Sensing Control System with Modules  Digital Oscilloscopes,  Function Generators,  Dual Channel Power Supplies,  Digital Multimeters&  Different range of component with breadboard as per lab Work. | , | See Note Below |
| 2 | **Computation & Design Lab** | 50 Modeling & Simulation Work Stations. |  | 1:1, Equipment: Student |
| 3 | **Digital System Lab /**  **Microprocessors &**  **Interfacing Lab** | 16 Work Stations Comprising: Intel Core i3 computer System,  Advance Digital Trainers,  DSP Trainer,  Logic Trainers,  Logic Analyzer (32 Channel),  Pickit 3,  Digital IC Tester,  FPGA Trainer Kit,  Servomotor full radiation,  Qadri Burner,  ARM development Kit,  Microprocessor 32 bit SK 80386N,  Micro Controller Trainer,  Digital Oscilloscopes,  Function Generators,  Dual Channel Power Supplies,  Digital Multimeters&  Different range of component with breadboard as per lab Work. |  | See Note Below |
| 4 | **Electronics Lab** | 14 Work Stations Comprising:  Intel Core i5 computer System |  | See Note Below |
|  |  | LCR Meter, EPROM,  Oscilloscopes,  Function Generators,  Dual Channel Power Supplies,  Digital Multimeters&  Different range of component with breadboard as per lab Work. |  | |
| 5 | **Industrial Automation Lab** | 14 Work Stations Comprising: Intel Core i3 computer System,  Advanced PLC Trainer,  Semen’s PLC –S7-300 Trainer,  PLC Logo 12/24 RC Trainer,  LCS Modules,  DSP Trainers,  Digital Oscilloscopes,  Function Generators,  Dual Channel Power Supplies,  Digital Multimeters&  Different range of component with breadboard as per lab Work. | See Note Below | |
| 6 | **Basic Electrical Engineering Lab** | 10 Work Stations Comprising:  Varnier caliper, Screw Gauge, Moment Arm, Glass  Slab, Simple Pendulum, Viscosity  Measurement, Vector Board Pully, Total Internal  Reflection Trainer, Ball Barings, Stop Watch  Packets (Different Diameters), Pascal Principal, Reflective Index of a Liquid, Force Table, Moment of Inertia & Drawing Boards. | See Note Below | |

**Note: - Experiments wherever performed are done in the ratio of 1:3, Equipment : Student**

# ANNEXURE-G2 (Lab Commitment Charts)



# ANNEXURE-G3 (Lab Course Outlines)

**PAF- KARACHI INSTITUTE OF ECONOMICS & TECHNOLOGY**

**SPRING-2018**

**CS-1301 (LAB) Introduction to computer programming (updated Sept 2019)**

**Course Title: Introduction to Computer Programming Lab**

**Credit Hours: 2+1**

**Course Code (L): CS1301**

**Instructor:**

**Email:**

**Contact Hours: 3 Hrs/wk**

**Lab Objective(s):**

The aim of this lab is to provide the students with the practical concepts of Computer Programming. Engineers of modern age needs to understand the fundamentals of how a digital system works. From a general purpose computer to an application specific embedded system, an engineer must know how to program a digital system to solve engineering problems.

**Lab Contents:**

Core of the lab course consist of various programming methodologies, like Top-down design approach that divides and conquer the bigger problem into smaller ones, that eventually leads to much simpler and easier solutions. Procedural programming language concept using C syntax that includes; interacting with **Standard IOs** and other ISO standards, automating **Arithmetic Expressions**, **Modular Programming**, **Indirect Data Addressing**, real life **Object Encapsulation**(partial) and topic related to effective memory utilization.

**Learning Outcomes:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Mapping of CLOs and PLOs** | | | |
| Sr. No | Course Learning Outcomes | PLOs | Bloom’s Taxonomy |
| **CLO1** | Recall the associated concepts of programming form theory | **PLO1** | **C1** (Recall) |
| **CLO2** | Problem identification, followed by thorough analysis and literature review, resulting in meaningful conclusions | **PLO2** | **C4** (Analyze) |
| **CLO3** | Design/Develop solutions for complex engineering problems covered under the scope of this course. | **PLO3** | **P4** (Mechanism) |
| **CLO4** | Implement different programming concepts i.e. input and output functions, conditional constructs and repetitive constructs. Pointes, Functions, Arrays, Structures, Dynamic Memory Allocation and observe their working | **PLO3** | **C3(**Apply) |
| **CLO5** | Interfacing different sensors using an Arduino boardand programming in Arguing | **PLO5** | **P3** ( Operate ) |
| **CLO6** | Properly handle lab infrastructure with safety precautions | **PLO8** | **P2** (Set) |
| **CLO7** | Assume responsibility and the use of resources to complete the assigned task with proper Teamwork | **PLO9** | **A3(**Assume responsibility**)** |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CLO Assessment Mechanism | | | | | | | | |
| **Assessment tools** | **CLO1** | **CLO2** | **CLO3** | **CLO4** | **CLO5** | **CLO6** | **CLO7** | **Assessment** |
| **Lab Manual** | **1.842%** | **0%** | **0%** | **33.156%** | **2.763%** | **2.149%** | **0%** | **40%** |
| **Lab Exam** | **0%** | **0%** | **0%** | **30%** | **0%** | **0%** | **0%** | **30%** |
| **Lab Project** | **0%** | **15%** | **10%** | **0%** | **10%** | **0%** | **5%** | **30%** |
| **Total** | **1.842%** | **15%** | **10%** | **63.156%** | **2.763%** | **2.149%** | **5%** | **100%** |

|  |  |
| --- | --- |
| **GRADING POLICY** | |
| **Assessment Items** | **Percentage** |
| **Lab Manuals** | **40%** |
| **Project** | **30%** |
| **Final Exam** | **30%** |

**Useful Web Resources:**

http://www.programmingsimplified.com/c-program-examples

<http://www.programiz.com/c-programming>

**Administrative Instructions:**

• Title of lab project should be submitted by 4th week of lab.

• According to institute policy, 80% attendance is mandatory to appear in the final examination but 100% will be expected. Approved leaves will not be considered towards attendance.

• Every student should bring lab manual in each lab.

• Every student is expected to be in lab before schedule starting time.

• In any case there will be no rescheduling and makeup of labs.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **LAB No.** | **LAB OBJECTIVE** | **CLOs** | **Marks** | **Sign** |
|  | **Logic Building:** Programming from Scratch Language | **4,6** |  |  |
|  | **Standard IOs :**PRINTF( ) and SCANF( ) plus Operators | **1,4,6** |  |  |
|  | **Selection Constructs:** IF-ELSE Statement and SWITCH Statement | **1,4,6** |  |  |
|  | **Repetition Constructs:** FOR Loops, WHILE and DO-WHILE Loops with comparison | **1,4,6** |  |  |
|  | **Cross Platform Development:** Exploring Arduino UNO board. | **1,5,6** |  |  |
|  | **Modular Programming I:**Pre-defined <math.h> and Programmer defined Functions | **1,4,6** |  |  |
|  | **Modular Programming II:** Factorial and Fibonacci with Recursion and Nested Loops | **1,4,6** |  |  |
|  | **Pointers :**Pass by reference versus Pass by value | **1,4,6** |  |  |
|  | **Arrays I:**Accessing Arrays, Bubble Sort and Linear Search | **1,4,6** |  |  |
|  | **Strings I:**Puppetting on Strings and pre-defined functions of <string.h> | **1,4,6** |  |  |
|  | **Arrays and String II:** Multi-dimensional Arrays and String function implementation | **1,4,6** |  |  |
|  | **Structures:** Declarations and Accessing Structure and Array of Structure | **1,4,6** |  |  |
|  | **Dynamic Memory Allocation:** Allocation and De-allocation versus Arrays | **1,4,6** |  |  |
|  | **Project Demonstration and Evaluation:** | **2,3,7** |  |  |
|  | **Semester Lab Exam:** | **4** |  |  |

**PAF- KARACHI INSTITUTE OF ECONOMICS & TECHNOLOGY**

**FALL-2019**

**EE-1407 (LAB) Digital logic fundamental (updated Fall 2019)**

**Course Digital Logic Fundamental Lab**

**Credit Hours : 3+1**

**Course Code (L): EE-1407**

**Instructor: Hamza**

**Email Address: Contact Hours: 3 hours / week**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Objectives:**

To provide hand on experience on various digital logics and signal conditioning modules and develop a deep understanding of the principles of sensing and interpreting the truth tables. Operate the Proteus cad tool circuit spice simulator for the given logics. To develop sufficient skills in students to design both sequential and combinational circuits and select proper logic, recording displays, and annunciation equipment for industrial and indigenous applications through a project.

**Recommended Book:**

**Digital Electronics – Principles and Applications**

Roger L. Tokheim (6th Edition)

**Administrative Instructions:**

* Title and Group members name for Lab/Course project should be submitted by 4th week of lab.
* According to institute policy, 80% attendance is mandatory to appear in the final examination but 100% will be expected. Approved leaves will not be considered towards attendance.
* Every student should bring calculator and manual in each lab.
* In design-oriented project work, the students deal with problems that can be solved by theories and knowledge they have acquired in their previous lectures. (Design Problems).

|  |  |  |  |
| --- | --- | --- | --- |
| **Mapping of CLOs and PLOs** | | | |
| **Sr. No** | **Course Learning Outcomes** | **PLOs** | **Blooms Taxonomy** |
| CLO\_1 | Recall the associated concepts form theory regarding various digital logic and signal Conditioning Circuits. | PLO\_1 | C1 (Recall) |
| CLO\_2 | Problem identification, followed by thorough analysis and literature review, resulting in meaningful conclusions | PLO\_2 | C3 (Apply) |
| CLO\_3 | Design/Develop solutions for complex engineering problems, making use of techniques used in labs to design a project | PLO\_3 | P4 (Mechanism) |
| CLO\_4 | Observe and experimentally validate the working of various sensors, their calibration, and data handling. | PLO\_4 | P3 (Guided Response) |
| CLO\_5 | Operate the Proteus cad tool circuit spice simulator for the given logics. | PLO\_5 | P3 (Operate) |
| CLO\_6 | Properly handle lab infrastructure with safety precautions | PLO\_8 | P2 (Set) |
| CLO\_7 | Assume responsibility and the use of resources to complete the assigned task with proper Teamwork | PLO\_9 | A3 (Assume Responsibility) |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **CLO Assessment Mechanism** | | | | | | | | |
| **Assessment tools** | **CLO1** | **CLO2** | **CLO3** | **CLO4** | **CLO5** | **CLO6** | **CLO7** | **Assessment** |
| Lab Manual | 2.89% | 0% | 0% | 17.21% | 3.68% | 2.89% | 3.35% | 30% |
| Lab Exam | 10% | 0% | 0% | 18% | 0% | 1% | 1% | 30% |
| Lab Project | 5% | 15% | 12% | 0% | 5% | 0% | 3% | 40% |
| Total | 17.89% | 15% | 12% | 35.19% | 8.69% | 3.88% | 7.34% | 100% |

|  |  |
| --- | --- |
| **Grading Policy** | |
| Lab Manual | 30% |
| Lab Exam | 30% |
| Lab Project | 40% |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No.** | **Lab Title** | **CLOs** | **Marks** | **Sign.** |
| **1** | Introduction to Proteus Software and Familiarization with Digital Integrated Circuits (ICs). | **5-7** |  |  |
| **2** | Introduction to Breadboard and verify the behavior of AND, OR, NOT, NAND, NOR and XOR Logic Gates using respective gate truth table. Also, design logic gates using basic instruments. | **1-4-5-6-7** |  |  |
| **3** | Implementation of Boolean expression. | **1-4-5-6-7** |  |  |
| **4** | To verify the behavior of Half-Adder and Full-Adder, and implement Four-Bit Parallel Adder. | **1-4-5-6-7** |  |  |
| **5** | To implement Two-Bit Comparator using Logic Gates  and verify the behavior of Four-Bit and Eight-Bit  magnitude comparator | **1-4-5-6-7** |  |  |
| **6** | To verify the behavior of Decoders and Encoders. | **1-4-6-7** |  |  |
| **7** | To verify the behavior of 7-Segment Display and BCD to 7-Segment Decoder. | **1-4-6-7** |  |  |
| **8** | To verify the Behavior of 8 to 1 Line Multiplexer and Quadruple 2-Line to 1-Line Data Selector/Multiplexer. | **1-4-6-7** |  |  |
| **9** | To design an Astable Circuit to produce 'Square Wave'. | **1-4-6-7** |  |  |
| **10** | To verify the behavior of the S-R (SET-RESET) Latch, gated S-R Latch, gated D Latch and evaluate latch as a Contact-Bounce Eliminator. | **1-4-6-7** |  |  |
| **11** | To verify the behavior of Edge-Triggered S-R Flip-Flop, Edge-Triggered D Flip-Flop and Edge-Triggered J-K Flip-Flop. | **1-4-6-7** |  |  |
| **12** | To design a Four-Bit Asynchronous Binary Counter, MOD-10 Asynchronous Binary Counter and MOD-6 Asynchronous Binary Counter using 74LS93 | **1-4-6-7** |  |  |
| **13** | To verify the behavior of Serial IN/Parallel OUT Shift Registers and Parallel IN/Serial OUT Shift Registers. | **1-4-6-7** |  |  |
| **14** | **Design-Oriented Project Work** | **1-2-3-5-7** |  |  |
| **15** | **Final Lab Exam** | **1-4-6-7** |  |  |

**PAF- KARACHI INSTITUTE OF ECONOMICS & TECHNOLOGY**

**FALL-2019**

**ME-2201 (LAB) Engineering drawing (updated Sept 2019)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Instructor: Muhammad Duraid**

**Email Address: m.duraid@pafkiet.edu.pk**

**Course Code: ME – 2201**

**Credit Hours: 0+2**

**Pre-requisite(s): None**

**Contact Hours: 6 hours / week**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Objectives**

The aim of the Engineering Drawing course is to develop and enhance the ability of the student to communicate engineering information and design by graphical means using conventional and CAD tools. This will be achieved through the ability to visualize and understand the appropriate graphical methods for representing design concepts

**Contents**

1. Engineering visualization principle, projection theory, and their applications in engineering drawing’
2. Hand sketching and computer aided drawing in engineering area
3. Engineering drawing techniques for adequate representation of engineering parts

**Learning Outcomes:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Mapping of CLOs and PLOs** | | | |
| **Sr. No.** | **Course Learning Outcomes (CLOs)** | **Program Learning Outcomes (PLOs)** | **Bloom’s Taxonomy** |
| CLO\_1 | Reproduce a standardized Engineering Drawing. | PLO\_1 | C2  (Comprehension) |
| CLO\_2 | Understand the Computer Aided Design tools to recreate a given object. | PLO\_5 | C3  (Apply) |
| CLO\_3 | Illustrate engineering drawing ideas as project. | PLO\_5 | C3  (Apply) |

**CLO-PLO Mapping Matrix**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **PLO** | | **CLO-1** | **CLO-2** | **CLO-3** |
| PLO-1 | Engineering knowledge | ✓ |  |  |
| PLO-2 | Problem Analysis |  |  |  |
| PLO-3 | Design/Development of solution |  |  |  |
| PLO-4 | Investigation |  |  |  |
| PLO-5 | Modern Tool usage |  | ✓ | ✓ |
| PLO-6 | The Engineer & society |  |  |  |
| PLO-7 | Environment & sustainability |  |  |  |
| PLO-8 | Ethics |  |  |  |
| PLO-9 | Individual and Team work |  |  |  |
| PLO-10 | Communication |  |  |  |
| PLO-11 | Project Management |  |  |  |
| PLO-12 | Lifelong Learning |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Assessment tools** | **CLO\_1** | **CLO\_2** | **CLO\_3** |
| **Lab Manuals** | 20% | 20% | 0% |
| **Project** | 0% | 0% | 40% |
| **Lab Exam** | 10% | 10% | 0% |
| **Total Assessments** | 30% | 30% | 40% |

|  |  |
| --- | --- |
| **Grading Policy** | |
| **Assessment Items** | **Percentage** |
| **Lab Manuals** | **40%** |
| **Project** | **40%** |
| **Lab Exam** | **20%** |

**Text Book:**

* Engineering Drawing – Plane and Solid Geometry by N. D. Bhatt, latest edition.

**Reference Book:**

* A First Year Engineering Drawing by A. C. Parkinson, latest edition.

**Course Outline**

|  |  |  |  |
| --- | --- | --- | --- |
| **LAB #** | **LAB TOPICS** | **LEARNING OBJECTIVES** | **CLOs** |
| 01 | Introduction to Engineering Drawing | * Instruments and their applications | CLO\_1 |
| 02 | Free hand sketching techniques | * Line Conventions * Measurements * Scale | CLO\_1 |
| 03 | Arcs and Lines | * Perpendicular bisectors * Division of a Line * Common arcs and lines | CLO\_1 |
| 04 | Tangents. | * From points to a circle * Common tangents of equal and unequal circles | CLO\_1 |
| 05 | Ellipse | * Concentric circle Method * Axes and foci method * Rectangle method * Isometric Steven’s Method | CLO\_1 |
| 06 | Construction of Templates | * 2D drawings with dimensions | CLO\_1 |
| 07 | Cycloids | * Cycloidal curves * Epicycloid * Hypocycloid | CLO\_1 |
| 08 | Involutes | * Involute to a given circle * Involute of a square and a triangle | CLO\_1 |
| 09 | Sectioning of Geometrical solids | * Cone * Cylinder * Square Prism * hexagonal pyramid | CLO\_1 |
| 10 | Interpenetration of Solids | * Intersecting cylinders * Intersection of cylinder and a square prism * Intersection of cylinder and a cone * Intersecting square prism | CLO\_1 |
| 11 | Surface Development | * Truncated cylinder * Cone * Lateral surface of a hexagonal prism | CLO\_1 |
| 12 | Orthographic Projections | * Third angle projection method | CLO\_1 |
| 13 | Sectional Views | * Full * Offset * Half * Broken * Revolved * Removed | CLO\_1 |
| 14 | Isometric Drawings | * Construction of 3D objects from Multi views. | CLO\_1 |
| 15 | Introduction to CAD Software | * Concept of Drawing Planes. * Basic Sketching on CAD Software. * Lines, Circles, Rectangle. | CLO\_2 |
| 16 | Introduction to 3D model | * Extrude Feature. * Boss Extrude. * Cut Extrude. | CLO\_2 |
| 17 | Introduction to Drawing | * Detailed Drawing of parts using Solid Works. | CLO\_2 |
| 18 | Advance Tools | * Array. * Offset. * Chamfer. * Fillet. | CLO\_2 |
| 19 | Final Part Making | * Revolve Base. * Revolve Cut. * Mirror. * Reference Geometry. * Sectional Views. | CLO\_2 |
| 20 | Advance features | * Lofted * Boss/Base * Lofted Cut | CLO\_2 |
| 21 | Threading | * Creating a thread onto a screw shaft. | CLO\_2 |
| 22 | Assemblies | * Mating of parts | CLO\_2 |
| 23 | Exploded View | * Taking apart an assembly to view individual components. | CLO\_2 |
| 24 | Implementation of Features and Tools | * Mass and Volume Calculation. * Deformation Animation.   Motion Analysis | CLO\_2 |
| 25 | Design and assemble a given part 1 | * Review of features use earlier. | CLO\_2 |
| 26 | Design and assemble a given part 1 | * Review of features use earlier. | CLO\_2 |
| 27 | Semester Project II | * Production of CAD model of an object with dimensions. | CLO\_3 |
| 28 | Final Lab Exam. | * Practical and Viva |  |

**PAF- KARACHI INSTITUTE OF ECONOMICS & TECHNOLOGY**

**SPRING-2019**

**ME-1102 (LAB) Workshop technology (updated Spring 2020)**

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**Instructor: Muhammad Farhan uz zaman Siddiqui**

Email Address: farhan.siddiqui@pafkiet.edu.pk

**Course Code: ME-1102**

**Credit Hours : 0+2**

**Pre-requisite(s): None**

**Contact Hours: 6Hrs/wk**

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**Objectives**

* To give basic introduction to general engineering workshop practices.
* To provide general safety procedures and use of Personal Protective equipment.
* To familiarize with various types of tools used for marking, cutting, finishing, holding, striking and assembling.
* To produce a part illustrated in a drawing using lathe, milling, shaper and drill machine etc.
* To practice electric arc welding.
* To provide a basic knowledge of house hold wiring.

**Text Book:** Workshop Technology, Latest Edition By W. A. J. Chapman

**Reference Book:** Lab Manuals provided by Instructor

|  |  |  |  |
| --- | --- | --- | --- |
| Mapping of CLOs and PLOs | | | |
| Sr. No. | Course Learning Outcomes (CLOs) | Program Learning Outcomes (PLOs) | Bloom’s Taxonomy |
| CLO1 | Understand basic workshop tools and their usage. | PLO 1 | C2 (Understand) |
| CLO2 | Demonstrate skills by performing assigned task using manufacturing tools. | PLO1 | P3 (Guided Response) |
| CLO3 | Follow safety precautions of workshop practices. | PLO8 | A3 (Valuing) |
| CLO4 | Assume responsibility to complete a task in a team. | PLO9 | A3 (Valuing) |
| CLO5 | Design/Develop solutions for complex engineering problems relating to workshop technology. | PLO3 | P4 (Mechanism) |

**CLO-PLO Mapping Matrix**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **PLO** | | **CLO-1** | **CLO-2** | **CLO-3** | **CLO-4** | **CLO-5** |
| PLO-1 | Engineering knowledge | ✓ | ✓ |  |  |  |
| PLO-2 | Problem Analysis |  |  |  |  |  |
| PLO-3 | Design/Development of solution |  |  |  |  | ✓ |
| PLO-4 | Investigation |  |  |  |  |  |
| PLO-5 | Modern Tool usage |  |  |  |  |  |
| PLO-6 | The Engineer & society |  |  |  |  |  |
| PLO-7 | Environment & sustainability |  |  |  |  |  |
| PLO-8 | Ethics |  |  | ✓ |  |  |
| PLO-9 | Individual and Team work |  |  |  | ✓ |  |
| PLO-10 | Communication |  |  |  |  |  |
| PLO-11 | Project Management |  |  |  |  |  |
| PLO-12 | Lifelong Learning |  |  |  |  |  |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Lab | **WORKSHOP TECHNOLOGY** | | | | | | Student ID | | | | |  | | | | | |
|  | | | | | | | | | | | | | | | | | |
| PLOs | PLO1 – Engineering Knowledge | | | | | | Bloom’s  Taxonomy | | | | | C2- Understand | | | | | |
| P3 – Guided Response | | | | | |
| PLO3 – Design/Development of solution | | | | | | P4 - Mechanism | | | | | |
| PLO8 - Ethics | | | | | | A3 – Valuing | | | | | |
| PLO9 – Team Work | | | | | | A3 – Valuing | | | | | |
| PERFROMANCE PARAMETERS | | | | | | | | | | | | | | | | | |
| CLOs | Aspects of Assessments | Excellent  (75-100%) | | | | | Average  (50-75%) | | | | | Poor  (<50%) | | | | | |
| **CLO1**  **PLO1** | Familiarization of tools | Complete understanding of the workshop tools and their uses | | | | | Partial understanding of workshop tools and their uses. | | | | | Student lacks clear understanding of workshop tools and their uses. | | | | | |
| **CLO2**  **PLO1** | Engineering Knowledge  Use of tools and machines to craft predefined objects and perform basic household wiring under guided supervision | Student efficiently uses tools and develop predefined object with accuracy of 0.5 to 1mm | | | | | Student able to use tools and develop predefined object with accuracy of 1.1 to 2mm | | | | | Student unable to use tools and unable to develop predefined object with accuracy of 1.1 to 2mm | | | | | |
| **CLO3**  **PLO8** | Lab Safety  Properly handle lab infrastructure/safety precautions | Properly handle lab equipment & obey safety measures with proper safety gear. | | | | | Moderate level lab handling and safety measurements with basic safety gear. | | | | | Minor or no safety measurements has been considered. | | | | | |
| **CLO4**  **PLO9** | Team Work  Completion of Lab tasks with proper team work and contribution. | Proactively work with other team members to complete assigned tasks. | | | | | Worked well with team but did not offer much positive feedback. | | | | | Very little, if any, contributions to group and less contribution in completion of overall lab tasks. | | | | | |
| **CLO5**  **PLO3** | Complex Engineering Problem Design or Develop solution for problem that meet specified needs by using the tools and machines. | A complete solution / Explain necessary theories according to task description with great use of tools and machines. | | | | | Solution was complete but need minor modifications /student could have followed specification more closely. | | | | | Solution was complete but did not work, needed several modifications / did not make correct use tools and machines. | | | | | |
| **EVALUATION OF LAB TASK** | | | | | | | | | | | | | | | | | |
| CLOs | Aspects of Assessments | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | F | P |
| CLO1 | Understanding |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CLO2 | Performance |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CLO3 | Lab Safety |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CLO4 | Team Work |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CLO5 | Complex Engineering Problem |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Marks Obtained in Each Lab | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

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| --- | --- | --- | --- | --- | --- | --- |
| **Assessment tools** | **CLO\_1** | **CLO\_2** | **CLO\_3** | **CLO\_4** | **CLO\_5** | **Assessment %** |
| **Lab Work** | 12% | 24% | 12% | 12% | 0% | 60% |
| **Project** | 0% | 0% | 0% | 6% | 24% | 30% |
| **Final Exam** | 4% | 3% | 3% | 0% | 0% | 10% |
| **Total** | 16% | 27% | 15% | 18% | 24% | 100% |

**Course Outline**

|  |  |  |
| --- | --- | --- |
| **LAB #** | **LAB TOPICS** | **CLOs** |
| **01** | **Introduction to Workshop Practices. Classification of tools their uses and safety procedures.** | CLO\_1  CLO\_2  CLO\_3  CLO\_4 |
| **02** | **Basic Lapped joints – Corner/Flat and Cross.** | CLO\_1  CLO\_2  CLO\_3  CLO\_4 |
| **03** | **Halved Lapped joints – Dove Tail.** | CLO\_1  CLO\_2  CLO\_3  CLO\_4 |
| **04** | **Advance Joints – Mitred Corner Joints.** | CLO\_1  CLO\_2  CLO\_3  CLO\_4 |
| **05** | **Advance Joints – Mortise and Tenon Joints.** | CLO\_1  CLO\_2  CLO\_3  CLO\_4 |
| **06** | **Advance Joints – 3 way lapped joints** | CLO\_1  CLO\_2  CLO\_3  CLO\_4 |
| **07** | **Use of Jig for straight and angular wood cutting to make a square puzzle.** | CLO\_1  CLO\_2  CLO\_3  CLO\_4 |
| **08** | **Development of Internal threads in aluminum block.** | CLO\_1  CLO\_2  CLO\_3  CLO\_4 |
| **09** | **Development of External thread on a metal rod.** | CLO\_1  CLO\_2  CLO\_3  CLO\_4 |
| **10** | **Metalwork 1 - Development of cross pein hammer from a square bar by simple filing.** | CLO\_1  CLO\_2  CLO\_3  CLO\_4 |
| **11** | **Metalwork 2 - Development of cross pein hammer from a square bar by simple filing.** | CLO\_1  CLO\_2  CLO\_3  CLO\_4 |
| **12** | **Metalwork 3 - Development of cross pein hammer from a square bar – drilling and handle fitting.** | CLO\_1  CLO\_2  CLO\_3  CLO\_4 |
| **13** | **To make a Square fit from M.S piece.** | CLO\_1  CLO\_2  CLO\_3  CLO\_4 |
| **14** | **To make a V-fit from M.S piece.** | CLO\_1  CLO\_2  CLO\_3  CLO\_4 |
| **15** | **Introduction to Shaper machine. Development of slots on a metal bar.** | CLO\_1  CLO\_2  CLO\_3  CLO\_4 |
| **16** | **Introduction to Lathe Machine.** | CLO\_1  CLO\_2  CLO\_3  CLO\_4 |
| **17** | **Operations of Lathe Machine: Facing, Turning, Taper turning and Undercutting.** | CLO\_1  CLO\_2  CLO\_3  CLO\_4 |
| **18** | **Operations of Lathe Machine: Threading, Drilling and Knurling.** | CLO\_1  CLO\_2  CLO\_3  CLO\_4 |
| **19** | **Operations of Milling Machine: Pocket Milling in a Metal Bar.** | CLO\_1  CLO\_2  CLO\_3  CLO\_4 |
| **20** | **Operations of Milling Machine: Machining a Hex Bolt using an indexing head.** | CLO\_1  CLO\_2  CLO\_3  CLO\_4 |
| **21** | **Joining of two given metal plates to obtain a Butt Joint by arc welding process.** | CLO\_1  CLO\_2  CLO\_3  CLO\_4 |
| **22** | **Joining of two given metal plates to obtain a Lap Joint by arc welding process.** | CLO\_1  CLO\_2  CLO\_3  CLO\_4 |
| **23** | **One way round ceiling LED switching connection and Fan Switching with Dimmer.** | CLO\_1  CLO\_2  CLO\_3  CLO\_4 |
| **24** | **Two way round ceiling LED switching connection and Doorbell connections.** | CLO\_1  CLO\_2  CLO\_3  CLO\_4 |
| **25** | **Final Lab.** | CLO\_1  CLO\_2  CLO\_3 |
| **26** | **Project.** | CLO\_4  CLO\_5 |

**PAF- KARACHI INSTITUTE OF ECONOMICS & TECHNOLOGY**

**SPRING-2019**

**EE-1401 (LAB) Linear circuit analysis (updated Sept 19)**

**Course: Linear Circuit Analysis Lab Credit Hours: 3+1**

**Course Code (L): EE1401**

**Instructor:**

**Email Address:**

**Contact Hours: 3 Hrs/wk**

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**Objectives:**

To understand the basic concepts of DC circuits behavior and their mathematical representations.

**Contents:**

Familiarization with DC current and voltage measuring devices, practice the hardware implementation of DC circuits, understand the concept of voltage and current divider circuits, understand the working principle of KCL and KVL using Mesh and Nodal analysis, observe the concept of Super Nodal analysis, understand the concept of superposition, Norton’s and Thevenin’s theorem and implement their hardware circuit to analyze their response.

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| **Mapping of CLOs and PLOs** | | | |
| Sr. No | Course Learning Outcomes | PLOs | Bloom’s Taxonomy |
| CLO1 | Recall the associated concepts form theory regarding the active and passive circuit elements and the circuit analysis techniques and theorems. | PLO1 | C1 (Recall) |
| CLO2 | Problem identification followed by thorough  Analysis and literature review resulting in  Meaningful conclusion. | PLO2 | C3(Apply) |
| CLO3 | Design/Develop solutions for complex  Engineering problems covered under the scope of  This course. | PLO3 | P4 (Mechanism) |
| CLO4 | Observe and experimentally validate the studied  circuit theorems and analysis techniques using the  studied circuit elements such as resistors,  capacitors, inductors and voltage/current sources. | PLO4 | P3 (Guided Response) |
| CLO5 | Operate the Multisim CAD tool circuit SPICE  simulator for the given circuits. | PLO5 | P3 (Operate) |
| CLO6 | Properly handle lab infrastructure with safety  precautions. | PLO8 | P2(Set) |
| CLO7 | Assume responsibility and th use of resources to  complete the task with proper Teamwork. | PLO9 | A3(Assume responsibility) |

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| **CLO Assessment Mechanism** | | | | | | | | |
| **Assessment tools** | **CLO1** | **CLO2** | **CLO3** | **CLO4** | **CLO5** | **CLO6** | **CLO7** | **Assessment** |
| **Lab Manual** | **9.86%** | **0%** | **0%** | **14.46%** | **2.16%** | **1.6%** | **1.92%** | **30%** |
| **Lab Exam** | **10%** | **0%** | **0%** | **15%** | **5%** | **0%** | **0%** | **30%** |
| **Lab Project** | **0%** | **5%** | **20%** | **0%** | **10%** | **0%** | **5%** | **40%** |
| **Total** | **19.86%** | **5%** | **20%** | **29.46%** | **17.16%** | **1.6%** | **6.92%** | **100%** |

|  |  |
| --- | --- |
| **Grading Policy** | |
| Lab Manual | 30% |
| Lab Exam | 30% |
| Lab Project | 40% |

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| --- | --- | --- |
| **Lab No.** | **Lab Title** | **CLOs** |
| 1 | Fabrication of Simple Resistive Networks and Measuring their Voltages and Currents using a DMM. | CLO\_1, CLO\_2 |
| 2 | To understand and experimentally verify Kirchhoff’s Current Law and Voltage Law. | CLO\_1, CLO\_2 |
| 3 | By using the concept of Current Divider, Voltage Divider Circuit experimentally validate the circuits& Familiarization with Software Simulation (MULTISIM) | CLO\_1, CLO\_2 |
| 4 | To understand and experimentally verify the Nodal Analysis | CLO\_1, CLO\_2 |
| 5 | To understand and experimentally verify the super nodal analysis | CLO\_1, CLO\_2 |
| 6 | To understand and experimentally verify the mesh and super mesh analysis | CLO\_1, CLO\_2 |
| 7 | To understand and experimentally verify the Norton and Thevenin’s Theorem | CLO\_1, CLO\_2 |
| 8 | Familiarization with Oscilloscope and Function generator and analyze the response of simple resistive circuit with sine wave. | CLO\_1, CLO\_2 |
| 9 | To understand and experimentally verify the Superposition theorem. | CLO\_1, CLO\_2 |
| 10 | Demonstration of Soldering and placement of basic components on Vero-board Project: | CLO\_1, CLO\_2 |
| 11 | To understand and experimentally verify Maximum Power Transfer Theorem | CLO\_1, CLO\_2 |
| 12 | Measuring the unknown value ofcapacitance of a capacitor by analyzing the capacitor response. | CLO\_1, CLO\_2 |
| 13 | Analyze the response of RC circuits when energized by an independent voltage source. | CLO\_1, CLO\_2 |
| 14 | Measuring the unknown value of a inductance of a inductor by analyzing the inductor response. | CLO\_1, CLO\_2 |
| 15 | **Final Lab Exam** | CLO\_1,CLO\_2 |
| 16 | **Project** | CLO\_3 |

**PAF- KARACHI INSTITUTE OF ECONOMICS & TECHNOLOGY**

**FALL -2019**

**EE-2425 (LAB) Electrical machines (updated Sept 2019)**

**Course : Electrical Machines Lab**

***Credit Hours : 3+1***

**Course code: EE-2425**

**Instructor: Muhammad Tehreem**

**Email Address:**

**Contact Hours: 3 hours / week**

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**Objectives:**

The main focus of this lab is to observe the working principle of single phase transformers, three phase transformers, three phase AC machines & DC machines.

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| --- | --- | --- | --- |
| **Mapping of CLOs and PLOs** | | | |
| **Sr. No** | **Course Learning Outcomes** | **PLOs** | **Blooms Taxonomy** |
| CLO\_1 | To determine the turns ratio and apply standard testing procedures for making transformer’s equivalent circuit.  To observe the voltage regulation of transformer on various loads.  To observe and analyze the output of three phase transformers for wye& delta connections. | PLO\_4 | P1(Observe) |
| CLO\_2 | To apply different starting methods for starting AC machines.  To apply standard procedures for determining the output characteristics of three phase AC machines. | PLO\_4 | P5 (Apply) |
| CLO\_3 | To observe & compare the output characteristics of DC machines. | PLO\_1 | P1(Observe) |
| CLO\_4 | To be able to apply concepts of Electrical Machines and design project. | PLO\_3 | A2(Responding) |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CLO Assessment Mechanism** | | | | |
| **Assessment tools** | **CLO\_1** | **CLO\_2** | **CLO\_3** | **CLO\_4** |
| **Lab Manual** | **12.3%** | **18.48%** | **9.24%** | **0** |
| **Lab Exam** | **10%** | **20%** | **10%** | **0** |
| **Lab Project** | **0** | **0** | **0** | **20%** |

|  |  |
| --- | --- |
| **Grading Policy** | |
| **Lab Manual** | **40%** |
| **Lab Exam** | **40%** |
| **Lab Project** | **20%** |

***Recommended Book:***

**Electric Machinery Fundamentals (4th Edition)**

By Stephan J. Chapman

***Administrative Instructions:***

* Title and Group members name for Lab/Course project should be submitted by 4th week of lab.
* According to institute policy, 80% attendance is mandatory to appear in the final examination but 100% will be expected. Approved leaves will not be considered towards attendance.
* Every student should bring calculator and manual in each lab.
* Every student is expected to be in lab before schedule starting time.
* In any case there will be no rescheduling and makeup of labs.

**Lab Practicals**

|  |  |  |  |
| --- | --- | --- | --- |
| **Lab No** | **Topics** | **Learning objectives** | **CLOs** |
| 1 | To determine the Turn Ratio and perform polarity test on a Transformer | * VA rating of a transformer * Voltage and current ratio of a transformer * Turns ratio and polarity of a transformer | CLO\_1 |
| 2 | To apply Open Circuit & Short Circuit Test on a Transformer | * Core losses of a transformer * Copper losses of a transformer * Equivalent circuit of a transformer | CLO\_1 |
| 3 | To determine voltage regulation & efficiency of a single phase Transformer on various loads | * Behavior of a transformer at loaded condition * Receiving end voltages at various types of load * Phasor diagram for various types of load | CLO\_1 |
| 4 | To determine the output of three phase transformers for wye &delta connections. | * Types of connection for three phase transformer * Phase & Line voltages for delta & wye connections | CLO\_1 |
| 5 | To compare different starting methods for AC motors. | * DOL starter for three phase Induction motor * Star-Delta starter for three phase Induction motor | CLO\_2 |
| 6 | To analyze the output Torque-Speed characteristics & efficiency of three phase induction motor (wound rotor & squirrel cage). | * Difference between wound rotor & squirrel cage rotor * Input connections for three phase Three phase motor | CLO\_2 |
| 7 | To analyze the change in speed of squirrel cage Induction motor by pole changing method. | * Pole variation of a squirrel cage Induction motor | CLO\_2 |
| 8 | To analyze the Torque- Speed characteristics & efficiency of  a three phase synchronous motor. | * Connections of a three phase synchronous motor * Output characteristics of a three phase synchronous motor | CLO\_2 |
| 9 | To experiment the use of synchronous motor as power factor improvement device. | * ‘V’ and ‘Inverted V’ curves of a synchronous motor | CLO\_2 |
| 10 | To analyze the Volt-Amp characteristics & efficiency of three phase synchronous generator. | * Connections of a three phase synchronous generator * Output characteristics of a three phase synchronous generator | CLO\_2 |
| 11 | Output volt-amp characteristics of a shunt & series DC generator. | * Connections of a DC generator * Output characteristics of shunt DC & series DC generators | CLO\_3 |
| 12 | Speed control of Separately excited dc motor. | * Connections of a DC motor * Speed control of a Separately excited DC motor | CLO\_3 |
| 13 | Speed control of dc shunt motor. | * Connections of a DC motor * Speed control of a DC shunt motor | CLO\_3 |
| 14 | Lab Exam |  | CLO\_1, CLO\_2, CLO\_3 |
| 15 | Project Evaluation |  | CLO\_4 |
|  |  |  |  |

**PAF- KARACHI INSTITUTE OF ECONOMICS & TECHNOLOGY**

**FALL-2019**

**EE-2403 Fundamentals of Electronics (Lab)**

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**Instructor: Engr. Sofia**

**Email Address:**

**Course Code: EE-2403**

**Credit Hours : 3+1**

**Pre-requisite(s): LCA**

**Contact Hours: 12Hrs**

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**Course Objective:**

This course is aimed to understand, construct, analyze and troubleshoot simple DC circuits of solid-state DC devices and to operate electronic test equipment such as multimeter, power supply, function generator, and oscilloscope. Also identify the unique vocabulary associated with electronics and explain the basic concepts of solid-state devices and semiconductor diodes such as P-N junction diode and its characteristics curve and to build a comprehensive foundation in the dc analysis of basic and most relevant electronics devices from structural and operational point of view and lays down the foundation for later advanced courses.

**Learning Outcomes:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Mapping of CLOs and PLOs** | | | |  |
| Sr. No. | Course Learning Outcomes (CLOs) | Program Learning Outcomes (PLOs) | Bloom’s Taxonomy | |
| CLO\_1 | Understand or Identify the unique vocabulary associated with solid state devices. Operate electronic test equipment such as multimeter, power supply, function generator, oscilloscope. | PLO\_1 | C1 (Recall) | |
| CLO\_2 | Problem identification, followed by thorough analysis and literature review, resulting in meaningful conclusions | PLO2 | C3 (Apply) | |
| CLO\_3 | Design/Develop solutions for complex engineering problems covered under the scope of this course | PLO\_3 | P4 (Mechanism) | |
| CLO\_4 | Experimentally validate the basic concepts of Semiconductor diodes such as P-N junction diode IV characteristic. Apply the basics of diode to describe the working of rectifier circuits such as Full and half wave rectifiers through guidance and experimentally manipulate the application of transistors for Current and voltage amplification, characteristics of different amplifier configurations design and analyze the different biasing circuits. | PLO\_4 | P3 – (Operate under supervision / Manipulate with guidance) | |
| CLO\_5 | Be able to manipulate /examine /compute biasing circuits of solid-state devices through modern tool usage (MULTISIM). | PLO\_5 | P3 (Operate) | |
| CLO\_6 | Properly set/handle lab infrastructure with safety precautions | PLO\_8 | P2 (Set) | |
| CLO\_7 | Be able to assume responsibility and use resources to achieve assigned go  ls through Teamwork. | PLO\_9 | A3 – (Behave according to / show concern / assume responsibility) | |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Assessment | CLO\_1 | CLO\_2 | CLO\_3 | CLO\_4 | CLO\_5 | CLO\_6 | CLO\_7 | Assessment |
| **Lab**  **Manual** | 3.45% | 0% | 0% | 9.7% | 10.85% | 3% | 3% | 30% |
| **Lab Exam** | 5% | 9% | 0% | 10% | 5% | 1% | - | 30% |
| **Project** | 0% | 7% | 10% | 10% | 10% | - | 3% | 40% |
| **Total** | 8.45% | 16% | 10% | 29.7% | 25.85% | 4% | 6% | 100% |

|  |  |  |
| --- | --- | --- |
|  | Grading Policy | |
| Assessment Items | | Percentage (%) |
| Lab Manual | | 30 |
| Lab Exam | | 30 |
| Project | | 40 |

**Lab Practical:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| S.no | Title | CLOs | Marks | Sign |
| 1. | Operate electronic test equipment such as multi-meter, power supply, function generator, oscilloscope & other primary electronic lab instruments with suitable examples. | CLO\_1,5,6,7 |  |  |
| 2. | Experimental study of the IV curves of PN junction Diode. | CLO\_1,4,6,7 |  |  |
| 3. | Implementation and experimental validation of Half Wave & Full Wave rectifier circuits. | CLO\_4,5,6,7 |  |  |
| 4. | Implementation and experimental validation of Peak Rectifier. | CLO\_4,5,6,7 |  |  |
| 5. | Experimentally study the Zener Diode and its characteristic curve. | CLO\_1,4,5,6,7 |  |  |
| 6. | Implementation and experimental validation of Clippers & Clampers Circuits. | CLO\_4,5,6,7 |  |  |
| 7. | Experimental study of the IV characteristics of BJT (NPN). | CLO\_1,5,6,7 |  |  |
| 8. | Experimental study of the IV characteristics of BJT (PNP). | CLO\_1,5,6,7 |  |  |
| 9. | Implementation and experimental validation of BJT DC biasing technique. | CLO\_4,5,6,7 |  |  |
| 10. | Experimentally study JFET IV characteristics curve. (N-channel). | CLO\_1,4,5,6,7 |  |  |
| 11. | Experimentally study JFET IV characteristics curve. (P-channel). | CLO\_1,4,5,6,7 |  |  |
| 12. | Implementation and experimental validation of DC-Biasing circuits. | CLO\_4,5,6,7 |  |  |
| 13. | Experimental study of basic JFET circuits. | CLO\_4,5,6,7 |  |  |
| 14. | Lab Exam. | CLO\_1,2,4,5,6 |  |  |
| 15. | Project. | CLO\_2,3,4,5,7 |  |  |

***Administrative Instructions:***

Title and Group members name for Lab/Course project should be submitted by 4th week of lab.

According to institute policy, 80% attendance is mandatory to appear in the final examination but 100% will be expected. Approved leaves will not be considered towards attendance.

Every student should bring calculator and manual in each lab. Every student is expected to be in lab before schedule starting time.

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| Lab | Fundamental of Electronics | | | | | | Student ID | | | | |  | | | | | |
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| PLOs | PLO1 – Engineering Knowledge | | | | | | Bloom’s Taxonomy | | | | | C1 – Recall | | | | | |
| PLO2 – Problem Analysis | | | | | | C3 – Apply | | | | | |
| PLO3 – Design and Development | | | | | | P4 – Mechanism | | | | | |
| PLO4 – Investigation | | | | | | P3 – Guided Response | | | | | |
| PLO5 – Modern Tool Usage | | | | | | P3 – Operate | | | | | |
| PLO9 – Team Work | | | | | | A3 – Assume Responsibility | | | | | |
| PLO8 – Ethics | | | | | | P2 – Set | | | | | |
| PERFROMANCE PARAMETERS | | | | | | | | | | | | | | | | | |
| CLOs | Aspects of Assessments | Excellent  (75-100%) | | | | | Average  (50-75%) | | | | | Poor  (<50%) | | | | | |
| CLO1 PLO1 | Recall: Recall basic passive circuit elements and their Functionality/Recall the basic concepts of Linear Circuit Analysis. | Complete understanding of the concepts / actively participate during lecture /read and interpret schematic diagrams, | | | | | Understand some concepts / participates less in class / read Schematics but unable to interpret them accurately. | | | | | Student lacks clear understanding of the basic concepts of Circuit Analysis. Read schematic but unable to interpret completely. | | | | | |
| CLO2 PLO2 | Problem Analysis Problem identification, analysis /literature review, resulting in meaningful conclusions | Completely identifies the problem in question through efficient analysis/produces near to exact results | | | | | Partially identifies the problem in question and with academic support produces the required results. | | | | | Lack of identification of the problem, needing more than par support to analyze the problem and production of results. | | | | | |
| CLO3 PLO3 | Design & Development Design / Develop solutions for complex engineering problems covered under the scope of this course | A complete solution / Explain necessary theories according to task description with great use of time and resource material. | | | | | Solution was complete but need minor modifications / student could have followed specification more closely. | | | | | Solution was complete but did not work, needed several modifications / did not make correct use of resource material or instructions. | | | | | |
| CLO4 PLO4 | Implementation Construction /  Realization of Circuits using bread board. | Student efficiently construct a circuit by following schematic diagram. | | | | | Construct a circuit by following  schematic diagram but with minor errors. | | | | | Construct a circuit accurately only with help from the teacher. | | | | | |
| Analysis Circuit Analysis of solid- state dc devices and their characteristic curve / data plotting and Experimental Verifications. | Accurately does circuit analysis / solid state devices characteristic curve graph plotting/correlate experimental results to expected  Theoretical values. | | | | | Conducts computations with minor error; and reasonably correlates results to known theoretical values. | | | | | Able to conduct analysis on collected data, no attempt to correlate experimental results with known theoretical values. | | | | | |
| CLO5 PLO5 | Tools Utilization Hardware equipment / Software tool usage for  Circuit implementation and analysis | Effectively use hardware equipment  / software tools to collect readings. | | | | | Uses hardware equipment /software tools to collect and analyze data with  minor error. | | | | | Does not know how to use hardware equipment /software tools to collect and  analyze data. | | | | | |
| CLO6  PLO8 | Lab Safety Properly handle lab infrastructure/ safety precautions | Properly handle lab equipment & obey safety measures. | | | | | Moderate level lab handling and safety measurements | | | | | Minor or no safety measurements has been considered. | | | | | |
| CLO7 PLO9 | Team Work Completion of Lab tasks with proper team work and  contribution. | Proactively work with other team members to complete assigned tasks. | | | | | Worked well with team but did not offer much positive feedback. | | | | | Very little, if any, contributions to group and less contribution in completion of  overall lab tasks. | | | | | |
| EVALUATION OF LAB TASK | | | | | | | | | | | | | | | | | |
| CLOs | Aspects of Assessments | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | F | P |
| CLO1 | Recall |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CLO2  CLO3 | Problem Analysis |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Engineering Problem |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CLO4 | Experimental validation |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CLO4 | Data Analysis |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CLO5 | Modern Tools Usage |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CLO6 | Lab Safety |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CLO7 | Team Work |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Marks Obtained in Each Lab | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

**PAF- KARACHI INSTITUTE OF ECONOMICS & TECHNOLOGY**

**FALL-2019**

**ME-3408 (LAB) Fluid mechanics (updated Sept 2019)**

**Course : Fluid Mechanics Lab**

**Credit Hours *:* 3 + 1**

**Course Code (L): ME - 3408**

**Instructor: Hamza Hamid Taimuri**

**Email Address:**

**Contact Hours: 3 hours / week**

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**Objectives:**

The students will learn to conduct experiments to verify fundamental principles of fluid mechanics, calibrate measuring devices, analyze experimental data and develop empirical relations when appropriate.

This lab has four objectives:

1) To compare the results of analytical models introduced in lecture to the actual behavior of real fluid flows; 2) to discuss and practice standard measurement techniques of fluid mechanics and their applications;

3) to learn and practice writing technical reports; and

4) to work on small design projects.

**Contents:**

The course comprises of experiments and demonstrations related to U-Tube Manometer, Centrifugal Pump, Bernoulli’s Theorem, Venturi& Orifice Tube, Pitot Tube, Pipe fitting & gate valve losses, Pipe friction losses (Laminar & Turbulent flows), Hydrostatic Pressure, Jet Force through nozzle.

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| **CLO Assessment Mechanism** | | | | | | | | |
| **Assessment tools** | **CLO1** | **CLO2** | **CLO3** | **CLO4** | **CLO5** | **CLO6** | **CLO7** | **Assessment** |
| Lab Manual | 11.14% | 11.14% | 9.12% | 9.36% | 4.62% | 4.62% | 0% | 50% |
| Lab Project | 0% | 0% | 0% | 0% | 0% | 0% | 20% | 20% |
| Lab Exam | 3% | 3% | 9% | 9% | 3% | 3% | 0% | 30% |
| Total | 14.14% | 14.14% | 18.12% | 18.36% | 7.62% | 7.62% | 20% | 100% |

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| **Grading Policy** | |
| Lab Manuals | 50% |
| Lab Project | 20% |
| Lab Exam | 30% |

**Text Books:**

1. Fluid Mechanics, 5th Edition by **F M. White**, Published by McGraw-Hill Education, 2003.
2. Fundamental of Fluid Mechanics, 7th Edition, **B R Munson, D F Young and T H Oliishe, J Wiley**, 2012.
3. Hydraulics (Basic Level TP 501) by **Markk, D., B. Scharader, and M. Thomes** (1990).

**Reference Books:**

1. Pneumatic and Hydraulic Systems, by **W. Bolton, Butterworth Heinemann**, 1997.
2. Engineering Fluid Mechanics, 8th Edition, revised by **C T Crowe, D F Elger, J A Roberson, Published by John Wiley & Sons**,2007.

**Administrative Instructions:**

* According to institute policy, 80% attendance is mandatory to appear in the final examination but 100% will be expected. Approved leaves will not be considered towards attendance.
* Every student should bring calculator and manual in each lab.
* Every student is expected to be in lab before schedule starting time.

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| Lab | Fluid Mechanics | | | | | | | | Student ID | | | | | |  | | | |
| PLOs | PLO1 – Engineering Knowledge | | | | | | | | Bloom’s  Taxonomy | | | | | | C1 – Recall | | | |
| PLO3 – Design and Development | | | | | | | | P4 – Mechanism | | | |
| PLO4 – Investigation | | | | | | | | P3 – Guided Response | | | |
| PLO8 – Ethics | | | | | | | | P2 – Set | | | |
| PLO9 – Team Work | | | | | | | | A3 – Assume Responsibility | | | |
|  | PERFORMANCE PARAMETERS | | | | | | | | | | | | | | | | | |
| CLOs | Aspects of Assessments | | Excellent  (75-100%) | | | | | | Average  (50-75%) | | | | | | Poor  (<50%) | | | |
| CLO1  PLO1 | Recall: Recall the associated concepts form theory regarding fluid statics and kinematics. | | Complete understanding of the concepts / actively participate during lecture /read & interpret basic concept of fluid statics and kinematics. | | | | | | Understand fluid statics and kinematics concepts / participates less in class / read fluid statics and kinematics but unable to interpret accurately. | | | | | | Student lacks clear understanding of fluid statics and kinematics concepts/ Unable to read and interpret fluid statics and kinematics completely. | | | |
| CLO2  PLO4 | Experimental Validation Observe the basic understanding of fluid (liquid) properties, their measuring units, their flow rates and types of flows. | | Student efficiently observe / validate the basic understanding of fluid (liquid) properties, their measuring units, their flow rates and types of flows. | | | | | | Observe the basic understanding of fluid (liquid) properties, their measuring units, their flow rates and types of flows but with minor errors. | | | | | | Basic understanding of fluid (liquid) properties, their measuring units, their flow rates and types of flows is validating accurately only with help from the teacher. | | | |
| CLO3  PLO4 | Experimental Validation  Perform practical ability to demonstrate fluid pressure in pipes, static pressure, flow measurement equipment’s and fluid machines (Pumps), their application in daily life/field.  Data Analysis Data Handling / Calculations / Plotting and Experimental Verifications. | | Student efficiently observe / validate the demonstration of fluid pressure in pipes, static pressure, flow measurement equipment’s and fluid machines (Pumps), their application in daily life/field.  Accurately does data analysis / plotting /correlate experimental results to expected theoretical values. | | | | | | Observe the demonstration of fluid pressure in pipes, static pressure, flow measurement equipment’s and fluid machines (Pumps), their application in daily life/field but with minor errors.  Conducts computations with minor error; and reasonably correlates results to known theoretical values. | | | | | | Demonstration of fluid pressure in pipes, static pressure, flow measurement equipment’s and fluid machines (Pumps), their application in daily life/field is validate accurately only with help from the teacher.  Able to conduct analysis on collected data, no attempt to correlate experimental results with known theoretical values. | | | |
| CLO4  PLO4 | Experimental Validation Analysis of fluid immersed or floating body’s bouncy, kinematics and dynamic behavior of fluids, hydrostatic pressure. Effects of pipe roughness on fluid flow. Impact of jet forces.  Data Analysis Data Handling / Calculations / Plotting and Experimental Verifications. | | Student efficiently observe / validate the analysis of fluid immersed or floating body’s bouncy, kinematics and dynamic behavior of fluids. Effects of pipe roughness on fluid flow. Impact of jet forces.  Accurately does data analysis / plotting /correlate experimental results to expected theoretical values. | | | | | | Observe the analysis of fluid immersed or floating body’s bouncy, kinematics and dynamic behavior of fluids. Effects of pipe roughness on fluid flow. Impact of jet forces but with minor errors.  Conducts computations with minor error; and reasonably correlates results to known theoretical values. | | | | | | Analysis of fluid immersed or floating body’s bouncy, kinematics and dynamic behavior of fluids. Effects of pipe roughness on fluid flow, Impact of jet forces is validating accurately only with help from the teacher.  Able to conduct analysis on collected data, no attempt to correlate experimental results with known theoretical values. | | | |
| CLO5  PLO8 | Lab Safety Properly handle lab infrastructure/ safety precautions | | Properly handle lab equipment & obey safety measures. | | | | | | Moderate level lab handling and safety measurements | | | | | | Minor or no safety measurements has been considered. | | | |
| CLO6  PLO9 | Team Work Completion of Lab tasks with proper team work and contribution. | | Proactively work with other team members to complete assigned tasks. | | | | | | Worked well with team but did not offer much positive feedback. | | | | | | Very little, if any, contributions to group and less contribution in completion of overall lab tasks. | | | |
| CLO7  PLO3 | Design & DevelopmentDesign / Develop solutions for complex engineering problems covered under the scope of this course & lab | | A complete solution / Explain necessary theories according to task description with great use of time and resource material. | | | | | | Solution was complete but need minor modifications /student could have followed specification more closely. | | | | | | Solution was complete but did not work, needed several modifications / did not make correct use of resource material or instructions. | | | |
| EVALUATION | | | | | | | | | | | | | | | | | | |
| CLOs | Aspects of Assessments | 1 | | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | | 13 | PT | FL |
| CLO1 | Recall |  | |  |  |  |  |  |  |  |  |  |  |  | |  | - |  |
| CLO2 | Experimental validation  Data Analysis |  | |  |  |  |  |  |  |  |  |  |  |  | |  | - |  |
| CLO3 | Experimental validation  Data Analysis |  | |  |  |  |  |  |  |  |  |  |  |  | |  | - |  |
| CLO4 | Experimental validation  Data Analysis |  | |  |  |  |  |  |  |  |  |  |  |  | |  | - |  |
| CLO5 | Lab Safety |  | |  |  |  |  |  |  |  |  |  |  |  | |  | - |  |
| CLO6 | Team Work |  | |  |  |  |  |  |  |  |  |  |  |  | |  | - |  |
| CLO7 | Engineering Problem | - | | - | - | - | - | - | - | - | - | - | - | - | | - |  | - |
| Marks Obtained in Each Lab | |  | |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |

**Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Lab Instructor: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Theory Teacher: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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| **No.** | **Lab Title** | **CLOs** | **Marks** | **Sign.** |
| 1 | Introduction to Fluid Mechanics. | 1-2 |  |  |
| 2 | To determine the unknown pressure applied by a source using U-Tube Manometer. | 1-2-3-5-6 |  |  |
| 3 | The objective of the experiment is to create a pump characteristic curve for centrifugal pump.  By controlling the valves, we can influence the system characteristic curve. In doing so, it is possible to operate the pump at different system resistances and to plot the relationship between pressure and volume flow. | 1-2-3-5-6 |  |  |
| 4 | To demonstrate Bernoulli’s Theorem. | 1-2-3-5-6 |  |  |
| 5 | To determine the discharge coefficient of the venturi meter. | 1-2-3-5-6 |  |  |
| 6 | To determine the flow rate of the Venturi and Orifice meter. | 1-2-3-5-6 |  |  |
| 7 | To determine the velocity of fluid flowing through the circular tube via a pitot tube. | 1-2-3-5-6 |  |  |
| 8 | To measuring the losses in the fittings related to flow rate and calculating loss coefficients related to velocity head. | 1-2-4-5-6 |  |  |
| 9 | To measuring the losses through gate valve related to flow rate and calculating loss coefficients related to velocity head. | 1-2-4-5-6 |  |  |
| 10 | To observe the type of flow by calculating the Reynold’s number by finding mean velocity of the fluid (SHELL S2 OIL). | 1-2-4-5-6 |  |  |
| 11 | To determine the pipe friction losses in laminar and turbulent flow. | 1-2-4-5-6 |  |  |
| 12 | To determine the Hydrostatic Pressure. | 1-2-4-5-6 |  |  |
| 13 | To find the force produce by the jet through nozzle. | 1-2-4-5-6 |  |  |
| 15 | Design-Oriented Project Work Evaluation | 7 |  |  |
| 16 | Final Lab Exam | 1-2-3-4-5-6 |  |  |

**PAF- KARACHI INSTITUTE OF ECONOMICS & TECHNOLOGY**

**SPRING-2018**

**ME-3307 (LAB) Fundamentals of thermal sciences (updated Sept 2019)**

**Course: Fundamentals of Thermal Sciences Credit Hours *:* 3 + 1**

**Course Code (L): ME - 3307**

**Instructor: Tauseef Nasir/Dr. Adil Loya**

**Email Address: tauseef@pafkiet.edu.pk**

**Contact Hours: 3 hours / week**

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**Objectives:**

The objective of this lab is to introduce the student the fundamental theories and the industrial applications of thermodynamics and heat transfer developed in class.

**Contents:**

The course comprises of experiments and demonstrations related to temperature measurement devices, the ideal gas laws, vapor compression cycle, heat transfer by conduction, heat transfer by convection and its types, laws governing heat transfer by radiation, second law analysis, heat transfer coefficient evaluation of heat exchangers, and extended surfaces.

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| **Mapping of CLOs and PLOs** | | | |
| **Sr. No** | **Course Learning Outcomes** | **PLOs** | **Bloom’s Taxonomy** |
| **CLO1** | Recall the associated concepts form theory regarding thermodynamics and heat transfer. | PLO1 | C1 (Recall) |
| **CLO2** | Compute the thermodynamic properties of fluids. | PLO4 | P3 (Guided Response) |
| **CLO3** | Observe the basic principles of thermodynamics on systems of refrigeration. | PLO4 | P3 (Guided Response) |
| **CLO4** | Observe thermodynamic parameters in modes of heat transfer on different materials. | PLO4 | P3 (Guided Response) |
| **CLO5** | Properly handle lab infrastructure with safety precautions. | PLO8 | P2 (Set) |
| **CLO6** | Assume responsibility and the use of resources to complete the assigned task with proper Teamwork. | PLO9 | A3(Assume responsibility) |
| **CLO7** | Design/Develop solutions for complex engineering problems covered under the scope of this course and lab. | PLO3 | P4 (Mechanism) |

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| **CLO Assessment Mechanism** | | | | | | | | |
| **Assessment tools** | **CLO1** | **CLO2** | **CLO3** | **CLO4** | **CLO5** | **CLO6** | **CLO7** | **Assessment** |
| Lab Manual | 5% | 10% | 2.5% | 22.5% | 5% | 5% | 0% | 50% |
| Lab Project | 0% | 0% | 0% | 0% | 0% | 0% | 20% | 20% |
| Lab Exam | 5% | 10% | 5% | 10% | 0% | 0% | 0% | 30% |
| Total | 10% | 20% | 7.5% | 32.5% | 5% | 5% | 20% | 100% |

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| **Grading Policy** | |
| Lab Manuals | 50% |
| Lab Project | 20% |
| Lab Exam | 30% |

**Text Books:**

1. Introduction to Thermodynamics and Heat Transfer, 2nd Edition McGraw Hill, by **Yunus A. Cengel.**
2. Fundamentals of Heat and Mass Transfer, 6th Edition John Wiley & Sons Inc., by **Frank P. Incopera et. al.**

**Reference Books:**

1. Thermodynamics an Engineering Approach, 5th Edition McGraw Hill, by **Yunus A. Cengel and Michael A. Boles.**
2. Fundamentals of Engineering Thermodynamics, 7th Edition John Wiley & Sons Inc., by **Howard N. Shapiro and Michael J. Moran.**

**Administrative Instructions:**

* According to institute policy, 80% attendance is mandatory to appear in the final examination but 100% will be expected. Approved leaves will not be considered towards attendance.
* Every student should bring calculator and manual in each lab.
* Every student is expected to be in lab before schedule starting time.

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| Lab | Fundamentals of Thermal Sciences | | | | | | | | Student ID | | | | | |  | | | | | |
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| PLOs | PLO1 – Engineering Knowledge | | | | | | | | Bloom’s  Taxonomy | | | | | | C1 – Recall | | | | | |
| PLO3 – Design and Development | | | | | | | | P4 – Mechanism | | | | | |
| PLO4 – Investigation | | | | | | | | P3 – Guided Response | | | | | |
| PLO8 – Ethics | | | | | | | | P2 – Set | | | | | |
| PLO9 – Team Work | | | | | | | | A3 – Assume Responsibility | | | | | |
|  | PERFORMANCE PARAMETERS | | | | | | | | | | | | | | | | | | | |
| CLOs | Aspects of Assessments | Excellent  (75-100%) | | | | | | | Average  (50-75%) | | | | | | Poor  (<50%) | | | | | |
| CLO1  PLO1 | Recall: Recall the associated concepts form theory regarding thermodynamics and heat transfer. | Complete understanding of the concepts / actively participate during lecture /read & interpret thermodynamics and heat transfer systems. | | | | | | | Understand thermodynamics and heat transfer concepts / participates less in class / read thermodynamics and heat transfer systems but unable to interpret accurately. | | | | | | Student lacks clear understanding of thermodynamics and heat transfer concepts/ Unable to read and interpret thermodynamics and heat transfer systems completely. | | | | | |
| CLO2  PLO4 | Experimental Validation Compute the thermodynamics properties of fluids. | Student efficiently observe / validate the thermodynamics properties of fluids. | | | | | | | Observe the thermodynamics properties of fluids but with minor errors. | | | | | | Thermodynamics properties of fluids is validate accurately only with help from the teacher. | | | | | |
| Data Analysis Data Handling / Calculations / Plotting and Experimental Verifications. | Accurately does data analysis / plotting /correlate experimental results to expected theoretical values. | | | | | | | Conducts computations with minor error; and reasonably correlates results to known theoretical values. | | | | | | Able to conduct analysis on collected data, no attempt to correlate experimental results with known theoretical values. | | | | | |
| CLO3  PLO4 | Experimental Validation Observe the basic principles of thermodynamics on systems of refrigeration. | Student efficiently observe / validate the basic principles of thermodynamics on systems of refrigeration . | | | | | | | Observe the basic principles of thermodynamics on systems of refrigeration but with minor errors. | | | | | | Basic principles of thermodynamics on systems of refrigeration is validate accurately only with help from the teacher. | | | | | |
| Data Analysis Data Handling / Calculations / Plotting and Experimental Verifications. | Accurately does data analysis / plotting /correlate experimental results to expected theoretical values. | | | | | | | Conducts computations with minor error; and reasonably correlates results to known theoretical values. | | | | | | Able to conduct analysis on collected data, no attempt to correlate experimental results with known theoretical values. | | | | | |
| CLO4  PLO4 | Experimental Validation Observe thermodynamic parameters on different modes of heat transfer on different materials. | Student efficiently observe / validate the thermodynamic parameters on different modes of heat transfer on different materials. | | | | | | | Observe the thermodynamics parameters on different modes of heat transfer on different materials but with minor errors. | | | | | | Thermodynamics parameters on different modes of heat transfer on different materials is validate accurately only with help from the teacher. | | | | | |
| Data Analysis Data Handling / Calculations / Plotting and Experimental Verifications. | Accurately does data analysis / plotting /correlate experimental results to expected theoretical values. | | | | | | | Conducts computations with minor error; and reasonably correlates results to known theoretical values. | | | | | | Able to conduct analysis on collected data, no attempt to correlate experimental results with known theoretical values. | | | | | |
| CLO5  PLO8 | Lab Safety Properly handle lab infrastructure/ safety precautions | Properly handle lab equipment & obey safety measures. | | | | | | | Moderate level lab handling and safety measurements | | | | | | Minor or no safety measurements has been considered. | | | | | |
| CLO6  PLO9 | Team Work Completion of Lab tasks with proper team work and contribution. | Proactively work with other team members to complete assigned tasks. | | | | | | | Worked well with team but did not offer much positive feedback. | | | | | | Very little, if any, contributions to group and less contribution in completion of overall lab tasks. | | | | | |
| CLO7  PLO3 | Design & DevelopmentDesign / Develop solutions for complex engineering problems covered under the scope of this course and lab | A complete solution / Explain necessary theories according to task description with great use of time and resource material. | | | | | | | Solution was complete but need minor modifications /student could have followed specification more closely. | | | | | | Solution was complete but did not work, needed several modifications / did not make correct use of resource material or instructions. | | | | | |
|  | EVALUATION | | | | | | | | | | | | | | | | | | | |
| CLOs | Aspects of Assessments | | 1 | 2 | 3 | 4 | 5 | 6 | | 7 | 8 | 9 | 10 | 11 | | 12 | 13 | 14 | PT | FL |
| CLO1 | Recall | |  |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  |
| CLO2 | Experimental validation | |  |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  |
| Data Analysis | |  |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  |
| CLO3 | Experimental validation | |  |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  |
| Data Analysis | |  |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  |
| CLO4 | Experimental validation | |  |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  |
| Data Analysis | |  |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  |
| CLO5 | Lab Safety | |  |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  |
| CLO6 | Team Work | |  |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  |
| Marks Obtained in Each Lab | | |  |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  |

**Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Lab Instructor: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Theory Teacher: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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| **No.** | **Lab Title** | **CLOs** | **Marks** | **Sign.** |
| 1 | Introduction to Thermodynamics and Heat Transfer Lab Equipment. | 1-2-5-6 |  |  |
| 2 | Temperature Measurement Methods.  Comparison of Accuracy and Methods of Calibration. | 1-2-5-6 |  |  |
| 3 | To determine the relationship between pressure and volume of an ideal gas.  To determine the relationship between temperature and pressure of an ideal gas. | 1-2-5-6 |  |  |
| 4 | To determine the ratio of volume assuming Isothermal and Isentropic processes and compares it to the theoretical value.  To determine the value of specific heat ratio “k”, assuming isentropic process. | 1-2-5-6 |  |  |
| 5 | To carry out the thermodynamic analysis of the Simple Compression Refrigeration Cycle. | 1-3-5-6 |  |  |
| 6 | To investigate Fourier's Law for the linear conduction of heat along a homogeneous bar.  To study the conduction of heat along a composite bar and evaluate the overall heat transfer coefficient.  To investigate the effect of a change in the cross-sectional area on the temperature profile along a thermal conductor. | 1-4-5-6 |  |  |
| 7 | To examine the temperature profile and determine the rate of heat transfer resulting from radial conduction through the wall of a cylinder.  To demonstrate the effect of surface contact on thermal conduction between adjacent slabs of material.  To investigate the influence of thermal insulation upon the conduction of heat between adjacent metals. | 1-4-5-6 |  |  |
| 8 | To demonstrate the relationship between power input and surface temperature in free and forced convection. | 1-4-5-6 |  |  |
| 9 | To demonstrate the relationship between power input and surface temperature in free and forced convection.  To demonstrate the use of extended surface to improve heat transfer from the surface.  To determine the temperature distribution along an extend surface. | 1-4-5-6 |  |  |
| 10 | To study different types of flows in a multi Heat Exchanger.  And conduct the second law analysis as well for various flows. | 1-4-5-6 |  |  |
| 11 | To evaluate the averaged overall heat transfer coefficient of different flow configurations of different types of heat exchangers. | 1-4-5-6 |  |  |
| 12 | To show that the intensity of radiation on a surface is inversely proportional to the square of the distance of the surface from the radiation source.  To show that the intensity of radiation varies as the fourth power the source temperature. | 1-4-5-6 |  |  |
| 13 | To determine the emissivity of radiating surfaces with different finishing, namely polished, grey and matt black.  To demonstrate how the emissivity of radiating surface in close proximity to each other will affect the surface temperature and heat exchanged. | 1-4-5-6 |  |  |
| 14 | To show that the intensity of radiation measured by the radiometer is directly related to the radiation emitted from a source by the view factor between the radiometer and the source.  (To demonstrate that the exchange of radiant energy from one surface to another is dependent upon their interconnecting geometry, i.e. a function of the amount that each surface can 'see' of the other). | 1-4-5-6 |  |  |
| 15 | Design-Oriented Project Work Evaluation | 7 |  |  |
| 16 | Final Lab Exam | 1-2-3-4 |  |  |

**PAF- KARACHI INSTITUTE OF ECONOMICS & TECHNOLOGY**

**SPRING-2019**

**EE-2404 (LAB) Electronic circuit design**

**Course: Electronic Circuit Design Lab**

***Credit Hours : 3+1***

**Course code (L): EE-2404**

**Instructor: Hamza**

**Email Address:**

**Contact Hours: 3 hours / week**

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**Objective:**

This course is aimed to understand, construct, analyze and troubleshoot simple BJT and MOSFET circuits by using electronic test equipment such as multimeter, power supply, function generator, and oscilloscope. Also identify the unique vocabulary associated with electronics and explain the basic concepts of BJT and MOSFET characteristic curves, DC response, Biasing techniques and their stability factor, Amplifier configurations (comparison between gain, input impedance, output impedance and bandwidth), frequency response (Miller effect) and multistage amplifiers. The circuit design or circuit synthesis paradigm by going through a systematic design of few basic components such as single-stage amplifiers, multi-stage amplifiers, output stages, etc.

**Learning Outcomes:**

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| **Mapping of CLOs and PLOs** | | | |
| **Sr. No.** | **Course Learning Outcomes (CLOs)** | **Program Learning Outcomes (PLOs)** | **Bloom’s Taxonomy** |
| **CLO\_1** | **Understand** or Identify the unique vocabulary associated with BJT and MOSFET devices for both low and high frequency regimes. Operate electronic test equipment such as multimeter, power supply, function generator, oscilloscope. | **PLO\_1** | **C1 (Understanding)** |
| **CLO\_2** | **Experimentally** validate the basic concepts of amplifiers and their characteristics including biasing, AC/DC response, gain, input/output impedance and frequency response. Apply the basics of BJT and MOSFET to describe the working of single stage CE amplifier circuit and its frequency response, cascade amplifier, cascade amplifier, push-pull amplifier and CMOS design through **guidance** and **experimentally manipulate** the application of transistors for Current and voltage amplification, characteristics of different amplifier configurations design and analyze the different biasing circuits. | **PLO\_4** | **P3 – (Operate under supervision / Manipulate with guidance)** |
| **CLO\_3** | **Design/Develop** solutions for complex engineering problems covered under the scope of this course | **PLO\_3** | **P4 (Mechanism)** |
| **CLO\_4** | Be able to **manipulate /examine /compute** biasing circuits of solid-state devices through modern tool usage (MULTISIM). | **PLO\_5** | **P3 (Operate)** |
| **CLO\_5** | Be able to assume **responsibility** and use resources to achieve assigned goals through Teamwork. | **PLO\_9** | **A3 – (Behave according to / show concern / assume responsibility)** |
| **CLO\_6** | Properly set/handle lab infrastructure with safety precautions | **PLO\_8** | **P2 (Set)** |

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| **Assessment tools** | **CLO\_1** | **CLO\_2** | **CLO\_3** | **CLO\_4** | **CLO\_5** | **CLO\_6** | **Assessment** |
| **Lab Manual** | 3% | 12% | - | 9% | 3% | 3% | 30% |
| **Lab Exam** | 5% | 10% | 5% | 7% | - | 3% | 30% |
| **Project** | 5% | 10% | 10% | 10% | 5% | - | 40% |
| **Total** | 13% | 32% | 15% | 26% | 8% | 6% | 100% |

|  |  |
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| **Grading Policy** | |
| **Assessment Items** | **Percentage (%)** |
| Lab Manual | 30% |
| Lab Exam | 30% |
| Project | 40% |
| **Total** | **100%** |

**Lab Practical**

|  |  |  |  |  |
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| **S.no** | **Title** | **CLOs** | **Marks** | **Sign** |
| 1. | Operate electronic test equipment such as multimeter, power supply, function generator, oscilloscope & other primary electronic lab instruments with suitable examples. | CLO\_1,2,4,5,6 |  |  |
| 2. | Experimental study of the IV curves of BJT. | CLO\_1,2,4,5,6 |  |  |
| 3. | Implementation of Transistor DC Response (Load-Line)and experimental validation of the results by using the Software Simulation in CAD tool (MULTISIM) | CLO\_1,2,4,5,6 |  |  |
| 4. | Implementation and experimental validation of Common Biasing techniques of Transistor-1 | CLO\_1,2,4,5,6 |  |  |
| 5. | Implementation and experimental validation of Common Biasing techniques of Transistor-2 | CLO\_1,2,4,5,6 |  |  |
| 6. | Implementation and experimental validation of Single Stage Common Emitter Amplifier | CLO\_1,2,4,5,6 |  |  |
| 7. | Implementation and experimental validation of Frequency response of Single Stage Common Emitter Amplifier | CLO\_1,2,4,5,6 |  |  |
| 8. | Implementation and experimental validation of Amplifier Design using BJT. | CLO\_1,2,4,5,6 |  |  |
| 9. | Experimental study of the IV curves of MOS transistor. | CLO\_1,2,4,5,6 |  |  |
| 10. | Experimentally study CMOS amplifier characteristics curve. | CLO\_1,2,4,5,6 |  |  |
| 11. | Implementation and experimental validation of CMOS amplifier design. | CLO\_1,2,4,5,6 |  |  |
| 12. | Implementation and experimental validation of CASCADE amplifier and its response. | CLO\_1,2,4,5,6 |  |  |
| 13. | Implementation and experimental validation of CASCODE amplifier and its response. | CLO\_1,2,4,5,6 |  |  |
| 14. | Implementation and experimental validation of Complimentary pair (push-pull) amplifier. | CLO\_1,2,4,5,6 |  |  |
| 15. | Lab Exam. | CLO\_1,2,3,4,6 |  |  |
| 16. | Project. | CLO\_1.2,3,4,5 |  |  |

**Text Books:**

Microelectronics Circuits by Adel S. Sedra, Kenneth C. Smith, Sixth Edition, Oxford University Press, 2010.

**Administrative Instructions:**

* Title and Group members name for Lab/Course project should be submitted by 4th week of lab.
* According to institute policy, 80% attendance is mandatory to appear in the final examination but 100% will be expected. Approved leaves will not be considered towards attendance.
* Every student should bring calculator and manual in each lab.
* Every student is expected to be in lab before schedule starting time.

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| Lab | Fundamental of Electronics | | | | | | Student ID | | | | |  | | | | | |
|  | | | | | | | | | | | | | | | | | |
| PLOs | PLO\_1 – Engineering Knowledge | | | | | | Bloom’s  Taxonomy | | | | | C2 – Understanding | | | | | |
| PLO\_3 – Design and Development | | | | | | P4 – Mechanism | | | | | |
| PLO\_4 – Investigation | | | | | | P3 – Manipulate with guidance | | | | | |
| PLO\_5 – Modern tool usage | | | | | | P3 - (Operate) | | | | | |
| PLO\_9 – Team Work | | | | | | A3 – Assume responsibility | | | | | |
| PLO\_8 – Ethics | | | | | | P2 – Set | | | | | |
| **PERFROMANCE PARAMETERS** | | | | | | | | | | | | | | | | | |
| **CLOs** | **Aspects of Assessments** | **Excellent**  **(75-100%)** | | | | | **Average**  **(50-75%)** | | | | | **Poor**  **(<50%)** | | | | | |
| **CLO1**  **PLO1** | **Recall:** Recall basic passive circuit elements and their Functionality/Recall the basic concepts of Linear Circuit Analysis and Fundamental of Electronics. | Complete understanding of the concepts / actively participate during lecture /read and interpret schematic diagrams, | | | | | Understand some concepts / participates less in class / read Schematics but unable to interpret them accurately. | | | | | Student lacks clear understanding of the basic concepts of Circuit Analysis and fundamental of electronics. Read schematic but unable to interpret completely. | | | | | |
| **CLO2**  **PLO4** | **Implementation** Construction / Realization of Circuits using bread board. | Student efficiently construct a circuit by following schematic diagram. | | | | | Construct a circuit by following schematic diagram but with minor errors. | | | | | Construct a circuit accurately only with help from the teacher. | | | | | |
| **Analysis** Circuit Analysis of solid-state dc devices and their characteristic curve / data plotting and Experimental Verifications. | Accurately does data analysis / solid state devices characteristic curve graph plotting/correlate experimental results to expected theoretical values. | | | | | Conducts computations with minor error; and reasonably correlates results to known theoretical values. | | | | | Able to conduct analysis on collected data, no attempt to correlate experimental results with known theoretical values. | | | | | |
| **CLO3**  **PLO3** | **Complex Engineering Problem**Design or Develop solution for problem that meet specified needs by using the concept of linear circuit analysis | A complete solution / Explain necessary theories according to task description with great use of time and resource material. | | | | | Solution was complete but need minor modifications /student could have followed specification more closely. | | | | | Solution was complete but did not work, needed several modifications / did not make correct use of resource material or instructions. | | | | | |
| **CLO4**  **PLO5** | **Tools Utilization** Hardware equipment / Software tool usage for Circuit implementation and analysis | Effectively use hardware equipment / software tools to collect readings. | | | | | Uses hardware equipment /software tools to collect data with minor error. | | | | | Does not know how to use hardware equipment /software tools to collect and analyze data. | | | | | |
| **CLO5**  **PLO9** | **Team Work** Completion of Lab tasks with proper team work and contribution. | Proactively work with other team members to complete assigned tasks. | | | | | Worked well with team but did not offer much positive feedback. | | | | | Very little, if any, contributions to group and less contribution in completion of overall lab tasks. | | | | | |
| **CLO6**  **PLO8** | **Lab Safety** Properly handle lab infrastructure with safety precautions | Properly handle lab equipment & obey safety measures. | | | | | Moderate level lab handling and safety measurements | | | | | Minor or no safety measurements has been considered. | | | | | |
| **EVALUATION OF LAB TASK** | | | | | | | | | | | | | | | | | |
| CLOs | Aspects of Assessments | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | F | P |
| CLO1 | Recall |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CLO2 | Implementation |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Result Analysis |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CLO3 | Engineering Problem |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CLO4 | Modern Tools Utilization |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CLO5 | Team Work |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CLO6 | Lab Safety |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Marks Obtained in Each Lab | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

**Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Lab Instructor: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Theory Teacher: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**PAF- KARACHI INSTITUTE OF ECONOMICS & TECHNOLOGY**

**SPRING-2019**

**EE-3405 (LAB) Linear integrated circuits and applications (updated Dec 2019)**

**Course: Linear Integrated Circuits and Applications Lab**

***Credit Hours: 3+1***

**Course Code (L): EE-3405**

**Instructor: Hamza**

**Email Address: Hamza.hamid@pafkiet.edu.pk**

**Contact Hours: 3 hours / week**

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**Objective:**

The courses focuses on delivering system-level awareness through the application of core-circuits (such as Operational Amplifiers) to synthesize practical circuits.

**Contents:**

* Getting familiar with Operational Amplifiers, its ideal characteristics
* Identify various practical Specifications and limitation of Op-Amp and measure offset error voltages / currents and other critical parameters to overcome its issues
* Briefly cover feedback topologies and stability analysis of Op-Amp based circuits
* Study small signal model (AC analysis) for designing of Active and Passive Filters
* Study the operation of Analog to Digital (ADC) and Digital to Analog (DAC) Data-Converters types and its applications

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| **Mapping of CLOs and PLOs** | | | |
| **Sr. No** | **Course Learning Outcomes** | **PLOs** | **Bloom’s Taxonomy** |
| **CLO1** | Recall the associated concepts form theory regarding the key parameters of an Op-Amp (its ideal characteristics, various configurations, DC imperfections) | **PLO1** | **C1** (Recall) |
| **CLO2** | Observe and Estimate specification of an Op-Amp by implementing its various configurations, and offset nulling techniques. | **PLO2** | **P1** (Observe) |
| **CLO3** | Construct and Model basic mathematical operations (comparator, summing and difference amplifier), filters, oscillators and data-convertors using Op-Amp-based circuits | **PLO4** | **C6**(Create) |
| **CLO4** | Be able to Implement and evaluate various system-level applications such as Mathematical operation, filters, oscillators and data-converters using SPICE software NI-  MultiSim | **PLO5** | **P3** (Guided Response) |
| **CLO5** | Design/Develop solutions for complex engineering problems covered under the scope of this course. | **PLO3** | **P4** (Mechanism) |
| **CLO6** | Assume responsibility and the use of resources to complete the assigned task with proper Teamwork. | **PLO9** | **A3(**Assume responsibility**)** |
| **CLO7** | Properly handle lab infrastructure with safety precautions. | **PLO8** | **P2** (Set) |

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| **Lab** | LINEAR INTEGERATED CIRCUIT AND APPLICATIONS | | | | | | **Student ID** | | | | |  | | | | |
|  | | | | | | | | | | | | | | | | |
| **PLOs** | **PLO1 – Engineering Knowledge** | | | | | | **Bloom’s Taxonomy** | | | | | **C1 - (Recall)** | | | | |
| **PLO2 – Problem Analysis** | | | | | | **P1 - (Observe)** | | | | |
| **PLO3 – Design and Development** | | | | | | **P4 – (Mechanism)** | | | | |
| **PLO4 - Investigation** | | | | | | **C6 – (Evaluate)** | | | | |
| **PLO5 – Modern Tool Usage** | | | | | | **P3 – (Guided Response)** | | | | |
| **PLO8 – Ethics** | | | | | | **P2 - (Set)** | | | | |
| **PLO9 – Team Work** | | | | | | **A3 - (Assume responsibility)** | | | | |
| **PERFROMANCE PARAMETERS** | | | | | | | | | | | | | | | | |
| **CLOs** | **Aspects of Assessments** | **Excellent**  **(75-100%)** | | | | | **Average**  **(50-75%)** | | | | | **Poor**  **(<50%)** | | | | |
| **CLO1 PLO1** | **Recall:** Recall the associated concepts form theory regarding the key parameters of an Op-Amp (its ideal characteristics, various  configurations, DC imperfections) | Complete understanding of the concepts / actively participate during lecture /read and interpret schematic diagrams, | | | | | Understand some concepts / participates less in class / read Schematics but unable to interpret them accurately. | | | | | Student lacks clear understanding of the basic concepts of Integrated Circuit. Read schematic but unable to interpret completely. | | | | |
| **CLO2 PLO2** | **Implementation:** Construction / Realization of Circuits by implementing various configuration of Op-Amp on bread  board. | Student efficiently construct a circuit by following schematic diagram. | | | | | Construct a circuit by following schematic diagram but with  minor errors. | | | | | Construct a circuit accurately only with help from the teacher. | | | | |
| **Data Analysis** Circuit Analysis / data plotting and Experimental Verifications. | Accurately does data analysis  / plotting /correlate experimental results to  expected theoretical values. | | | | | Conducts computations with minor error; and reasonably correlates results to known  theoretical values. | | | | | Able to conduct analysis on collected data, no attempt to correlate experimental results with known  theoretical values. | | | | |
| **CLO3 PLO3** | **Tools Utilization** Software tool usage for constructing various application of Op-Amp-based  circuits using NI-Multisim | Effectively use software tools to collect readings of Op- Amp-based circuits | | | | | Uses software tools to collect data with minor error. | | | | | Does not know how to use /software tools tocollect and analyze data. | | | | |
| **CLO4 PLO3** | **Evaluation:** Implement and evaluate various system-level applications such as filters, oscillators and data-converters. | Effectively use hardware equipment and tools to collect readings of filters, oscillators and data-convertors | | | | | Uses hardware equipment and tools to collect data with minor error. | | | | | Does not know how to use hardware equipment to tools to collect and analyze data. | | | | |
| **CLO5 PLO3** | **Design & Development** Design or Develop solution for problem that meet specified needs by using the concept of linear Integrated circuit  analysis | A complete solution / Explain necessary theories according to task description with great use of time and resource  material. | | | | | Solution was complete but need minor modifications / student could have followed specification more closely. | | | | | Solution was complete but did not work, needed several modifications / did not make correct use of resource material or instructions. | | | | |
| **CLO6 PLO9** | **Team Work** Completion of Lab tasks with proper team work and  contribution. | Proactively work with other team members to complete  assigned tasks. | | | | | Worked well with team but did not offer much positive  feedback. | | | | | Very little, if any, contributions to group and less contribution in  completion of overall lab tasks. | | | | |
| **CLO7 PLO8** | **Lab Safety** Properly handle lab infrastructure with safety  precautions | Properly handle lab equipment & obey safety measures. | | | | | Moderate level lab handling and safety measurements | | | | | Minor or no safety measurements has been considered. | | | | |
| **EVALUATION** | | | | | | | | | | | | | | | | |
| **CLOs** | **Aspects of Assessments** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **F** | **P** |
| **CLO1** | **Recall** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **CLO2** | **Problem Analysis** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **CLO3** | **Investigation** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **CLO4** | **Modern Tool Usage** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **CLO5** | **Design & Development** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **CLO6** | **Individual and Team work** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **CLO7** | **Lab Safety** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Marks Obtained in Each Lab** | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

**Signature: Signature:**

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| **CLO Assessment Mechanism** | | | | | | | | |
| **Assessment tools** | **CLO1** | **CLO2** | **CLO3** | **CLO4** | **CLO5** | **CLO6** | **CLO7** | **Assessment** |
| Lab Manual | 6% | 5.52% | 9.03% | 3.45% | 0% | 3% | 3% | 30% |
| Lab Exam | 0% | 9% | 9% | 10% | 0% | 0% | 2% | 30% |
| Lab Project | 0% | 0% | 0% | 15% | 20% | 5% | 0% | 40% |
| Total | 6% | 14.52% | 18.03% | 28.45% | 20% | 8% | 5% | 100% |

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| **Grading Policy** | |
| Lab Manual | 30% |
| Lab Exam | 30% |
| Lab Project | 40% |

**Recommended Book:**

•. Adel S. Sedra, Kenneth C. Smith Microelectronics Circuits Sixth Edition

**Reference Books:**

* Operational Amplifiers and linear Integrated Circuits
* Robert F. Coughlin Operational Amplifiers and linear Integrated Circuits Sixth Edition
* David Johns, Ken Martin Analog Integrated Circuit Design First Edition.
* Behzad Razavi Fundamentals of Microelectronics Second Edition.

**Administrative Instructions:**

* According to institute policy, 80% attendance is mandatory to appear in the final examination but 100% will be expected. Approved leaves will not be considered towards attendance.
* Every student should bring calculator and manual in each lab.
* Every student is expected to be in lab before schedule starting time.

In design-oriented project work, the students deal with problems that can be solved by theories and knowledge they have acquired in their previous lectures. (Design Problems).

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| **No.** | **Lab Titles** | **CLOs** | **Marks** | **Sign** |
| 1 | Use of Lab Instruments and Op-Amp offset nulling | CLO  (1, 2, 6, 7) |  |  |
| 2 | Comparator | CLO  (1, 3, 6, 7) |  |  |
| 3 | Inverting Configuration | CLO  (1, 2, 6, 7) |  |  |
| 4 | Non-Inverting Configuration | CLO  (1, 2, 6, 7) |  |  |
| 5 | Weighted Voltage Summer | CLO  (1, 3, 4, 6, 7) |  |  |
| 6 | Difference Amplifier | CLO  (1, 3, 6, 7) |  |  |
| 7 | Instrumentation Amplifier | CLO  (1, 2, 6, 7) |  |  |
| 8 | First order , Passive High Pass and Low Pass filter | CLO  (1, 3, 4, 6, 7) |  |  |
| 9 | First order and second order Active Low Pass filter | CLO  (1, 3, 4, 6, 7) |  |  |
| 10 | Op-Amp based Astable Multivibrator | CLO  (1, 3, 6, 7) |  |  |
| 11 | Wein Bridge Oscillator | CLO  (1, 4, 6, 7) |  |  |
| 12 | Astable Multivibrator using 555 timer | CLO  (1, 3, 6, 7) |  |  |
| 13 | DACs and ADCs | CLO  (1, 3, 6, 7) |  |  |
| 15 | Design-Oriented Project (Submission and Viva) | CLO  (4, 5, 6) |  |  |
| 16 | Final Lab | CLO  (2, 3, 4, 7) |  |  |

**PAF- KARACHI INSTITUTE OF ECONOMICS & TECHNOLOGY**

**SPRING-2018**

**ee-3417 (LAB) Microcontroller based systems**

**Course : Microcontroller Based Systems Lab *Credit Hours : 3+1***

**Course Code (L): EE-3417**

**Instructor:**

**Email Address:**

**Contact Hours: 3 hours / week \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Objectives:**

This lab aims to cover the internal architecture of Field programmable gate array (FPGA) Training Kit, Hardware description language (HDL) programming concepts and I/O interfaces of FPGA board. Students will develop comprehensive understanding regarding Xilinx software programming model and instruction set. Lab work will focus on FPGA training kit (Spartan 3E) and one of the HDL programming technique name as VHDL. Students will also learn interfacing of different peripheral with uses of different modules during this they also made a project on the behavior of the practice and knowledge they learn in lab work course.

**Contents:**

This course starts with a detailed description of architecture of microcontroller they will know this at register level. We then discuss the instruction set of PIC18F452 in detail so that student will grep this concept clearly. Next, different modules discuss in the lab, and then practical implementation with the software simulation also done by using the modules like timer, counter, A/D, PWM, serial communication, EEPROM memory and many other which this leads to a fruitful and competitive project.

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| **Sr. No** | **Course Learning Outcomes** | **PLOs** | **Bloom’s Taxonomy** |
| **CLO1** | Recall the associated concepts form theory regarding microprocessor  systems and architecture with interfacing techniques. | **PLO1** | **C1** (Recall) |
| **CLO2** | Problem identification, analysis /literature review, resulting in  meaningful conclusions | **PLO2** | **C3** (Apply) |
| **CLO3** | Design / Develop solutions for open ended problems covered under  the scope of this course | **PLO3** | **P4** (Mechanism) |
| **CLO4** | Observe the working of various module of microprocessor and micro-  controllers’ interface with different sensors and displays according to  the lab task | **PLO4** | **P3** (Guided Response) |
| **CLO5** | Interfacing different Input / Output peripherals devices with micro-  controller. | **PLO5** | **P3** (Operate) |
| **CLO6** | Properly handle lab infrastructure with safety precautions | **PLO8** | **P2** (Set) |

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| **Lab No.** | | **Learning Objectives** | | **CLOs** | |
| 1 | | Introduction to Xilinx ISE Design Suite12.1  Implement 4:1 Multiplexer. | | CLO\_2  CLO\_3 | |
| 2 | | To introduce Digilent Nexys2 Spartarn-3E FPGA development board  Illustrate implementation of an HDL-based design. | | CLO\_2  CLO\_3 | |
| 3 | | Construction of Basic Combinational logic design using Xilinx  Schematic tool. | | CLO\_2 | |
| 4 | | Design a system from simpler/predesigned components.  Introduction to Component Instantiation and Structural Description. | | CLO\_3 | |
| 5 | | Design system using abstract behavioral description.  Design bcd to seven-segment decoder and seven-segment driver. | | CLO\_3 | |
| 6 | | Familiarization with the IP Cores inXilinx ISE  Testing on ISim simulator. | | CLO\_2  CLO\_3 | |
| 7 | | Design a Sign-magnitude adder.  Introduction to ieee.numeric\_std package. | | CLO\_3  CLO\_1 | |
| 8 | | Designing and optimization of systems  using operator sharing technique. | | CLO\_1  CLO\_3 | |
| 9 | | Introduction to Sequential circuit design, including D  latch, D-flip-flop and shift register. | | CLO\_1  CLO\_3 | |
| 10 | | Introduction to ModelSim and different useful counters. | | CLO\_2 | |
| 11 | | Design Hypothetical Memory Controller using  Introduction to FSM. | | CLO\_1  CLO\_3 | |
| 12 | | Design Edge Detection Circuit using FSM  Explanation of FSM Timing  Diagram using Simulation tool. | | CLO\_1  CLO\_3 | |
| 13 | | Design Sequence Detection Circuit using FSM By  Using Both (Moore and Mealy) Technique. | | CLO\_1 | |
| 14 | | Design A FSM for The Solution of Any Practical  Life Example. | | CLO\_3 | |
| 15 | | Final Project Demonstration | | CLO\_1  CLO\_2  CLO\_3 | |
| 16 | | **Final Lab Exam** | | CLO\_1  CLO\_2 | |

**PAF- KARACHI INSTITUTE OF ECONOMICS & TECHNOLOGY**

**FALL-2019**

**EE-3306 (LAB) Instrumentation and measurement (updated Sept 2019)**

**Course : Instrumentation and Measurement Lab *Credit Hours : 3 + 1***

**Course Code (L): EE-3306**

**Instructor:**

**Email Address:**

**Contact Hours: 3hours/week** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Objectives:**

To develop sufficient skills in students for them to be able to design and select proper sensing, recording displays and annunciation equipment for industrial and indigenous applications.

**Contents:**

To provide hand on experience on various sensors and signal conditioning modules and develop a deep understanding of the principles of sensing and interpreting physical quantities To interface sensors and signal conditioning circuits with LabVIEW using Arduino. To develop sufficient skills in students to be able to design and select proper sensing, recording displays, and annunciation equipment for industrial and indigenous applications through a project.

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| **Mapping of CLOs and PLOs** | | | |
| **Sr. No** | **Course Learning Outcomes** | **PLOs** | **Bloom’s Taxonomy** |
| **CLO1** | Recall the associated concepts form theory regarding various sensors and signal Conditioning Circuits. | **PLO1** | **C1** (Recall) |
| **CLO2** | Problem identification, followed by thorough analysis and literature review, resulting in meaningful conclusions | **PLO2** | **C3** (Apply) |
| **CLO3** | Design/Develop solutions for complex engineering problems covered under the scope of this course. | **PLO3** | **P4** (Mechanism) |
| **CLO4** | Observe and experimentally validate the working of various sensors, their calibration, and data handling. | **PLO4** | **P3** (Guided Response) |
| **CLO5** | Interfacing different sensors & signal conditioning circuits with LabVIEW using an Arduino board. | **PLO5** | **P3** ( Operate ) |
| **CLO6** | Properly handle lab infrastructure with safety precautions | **PLO8** | **P2** (Set) |
| **CLO7** | Assume responsibility and the use of resources to complete the assigned task with proper Teamwork | **PLO9** | **A3(**Assume responsibility**)** |

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| CLO Assessment Mechanism | | | | | | | | |
| Assessment tools | CLO1 | CLO2 | CLO3 | CLO4 | CLO5 | CLO6 | CLO7 | Assessment |
| Lab Manual | 3% | 0% | 0% | 13.41% | 7.59% | 3% | 3% | 30% |
| Lab Exam | 10% | 0% | 0% | 20% | 10% | 0% | 0% | 40% |
| Lab Project | 0% | 6% | 15% | 0% | 6% | 0% | 3% | 30% |
| Total | 13% | 6% | 15% | 32% | 25% | 3% | 6% | 100% |

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| **Grading Policy** | |
| **Lab Manuals** | 30% |
| **Lab/Course Project** | 40% |
| **Lab Exam** | 30% |

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| **Lab** | **Instrumentation and Measurement** | | | | | | **Student ID** | | | | |  | | | | | |
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| **PLOs** | **PLO1 – Engineering Knowledge** | | | | | | **Bloom’s Taxonomy** | | | | | **C1 – Recall** | | | | | |
| **PLO2 – Problem Analysis** | | | | | | **C3 – Apply** | | | | | |
| **PLO3 – Design and Development** | | | | | | **P4 – Mechanism** | | | | | |
| **PLO4 – Investigation** | | | | | | **P3 – Guided Response** | | | | | |
| **PLO5 – Modern Tool Usage** | | | | | | **P3 – Operate** | | | | | |
| **PLO9 – Team Work** | | | | | | **A3 – Assume Responsibility** | | | | | |
| **PLO8 – Ethics** | | | | | | **P2 – Set** | | | | | |
| **PERFORMANCE PARAMETERS** | | | | | | | | | | | | | | | | | |
| **CLOs** | **Aspects of Assessments** | **Excellent**  **(75-100%)** | | | | | **Average**  **(50-75%)** | | | | | **Poor**  **(<50%)** | | | | | |
| **CLO1 PLO1** | **Recall:** Recall the associated concepts form theory regarding  various sensors and signal Conditioning Circuits. | Complete understanding of the concepts / actively participate during lecture /read & interpret signal Conditioning Circuits. | | | | | Understand sensor(s) concepts / participates less in class / read conditioning circuits but unable to interpret accurately. | | | | | Student lacks clear understanding of sensor concepts/ Unable to read and interpret signal conditioning circuit completely. | | | | | |
| **CLO2 PLO2** | **Problem Analysis** Problem identification, analysis /literature review, resulting in meaningful  conclusions | Completely identifies the problem in question through efficient analysis/produces near  to exact results | | | | | Partially identifies the problem in question and with academic support produces the required  results. | | | | | Lack of identification of the problem, needing more than par support to analyze the problem and production  of results. | | | | | |
| **CLO3 PLO3** | **Design & Development** Design  / Develop solutions for complex engineering problems covered under the scope of this course | A complete solution / Explain necessary theories according to task description with great use  of time and resource material. | | | | | Solution was complete but need minor modifications / student could have followed  specification more closely. | | | | | Solution was complete but did not work, needed several modifications / did not make correct use of resource  material or instructions. | | | | | |
| **CLO4 PLO4** | **Experimental Validation** Observe the working of various sensors, and their calibration | Student efficiently observe / validate working by following Circuit diagram. | | | | | Observe the sensor behavior by following schematic diagram but  with minor errors. | | | | | Sensor / Circuit working is validate accurately only with help from the teacher. | | | | | |
| **Data Analysis** Data Handling / Calculations / Plotting and Experimental Verifications. | Accurately does data analysis / plotting /correlate experimental results to expected theoretical  values. | | | | | Conducts computations with minor error; and reasonably correlates results to known  theoretical values. | | | | | Able to conduct analysis on collected data, no attempt to correlate experimental results with known  theoretical values. | | | | | |
| **CLO5 PLO5** | **Tools Utilization** Interfacing different sensors and signal conditioning circuits with  LabVIEW using Arduino board. | Successfully implement the interfacing logic to control all input / output elements through  Graphical program. | | | | | Implement the interfacing logic with less control of input / output elements through the Graphical  program. | | | | | Does not know how to interface a sensor and signal conditioning circuit through the Graphical program using  Arduino. | | | | | |
| **CLO6**  **PLO8** | **Lab Safety** Properly handle lab infrastructure/ safety precautions | Properly handle lab equipment & obey safety measures. | | | | | Moderate level lab handling and safety measurements | | | | | Minor or no safety measurements has been considered. | | | | | |
| **CLO7 PLO9** | **Team Work** Completion of Lab tasks with proper team work and  contribution. | Proactively work with other team members to complete  assigned tasks. | | | | | Worked well with team but did not offer much positive  feedback. | | | | | Very little, if any, contributions to group and less contribution in  completion of overall lab tasks. | | | | | |
| **EVALUATION** | | | | | | | | | | | | | | | | | |
| **CLOs** | **Aspects of Assessments** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **F** | **P** |
| **CLO1** | **Recall** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **CLO2** | **Problem Analysis** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **CLO3** | **Engineering Problem** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **CLO4** | **Experimental validation** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Data Analysis** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **CLO5** | **Modern Tools Usage** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **CLO6** | **Lab Safety** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **CLO7** | **Team Work** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Marks Obtained in Each Lab** | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

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| **No.** | **Lab Title** | **CLOs** | **Marks** | **Sign.** |
| 1 | Familiarization with Laboratory Instruments & Microcontroller Sensing Control Unit (KL 62001) | 5-6-7 |  |  |
| 2 | Experimentally validate Wheatstone bridge and measurement of the Un-known Resistances. | 1-4-6-7 |  |  |
| 3 | Experimentally validate the working of strain gauge and pressure sensor. Introduction to LabVIEW. | 1-4-5-6-7 |  |  |
| 4 | Observe and experimentally validate the working of Ultrasonic, Proximity & Hall effect sensor. | 1-4-6-7 |  |  |
| 5 | To study the characteristics of voltage to frequency and frequency to voltage convertor. | 1-4-6-7 |  |  |
| 6 | Observe and experimentally validate the working of Thermistor, its calibration, and data handling. | 1-4-6-7 |  |  |
| 7 | Observe and experimentally validate the working of RTD, its calibration, and data handling | 1-4-6-7 |  |  |
| 8 | Experimentally validate the working of various Position / Displacement Sensors and Data Acquisition through LabVIEW and Arduino board | 1-4-5-6-7 |  |  |
| 9 | Interfacing Ultrasonic sensor, LVDT & Rotational sensor with LabVIEW using an Arduino board. | 5-6-7 |  |  |
| 10 | Experimentally validate the working of Vibration sensors and Data Acquisition through LabVIEW and Arduino board. | 1-4-5-6-7 |  |  |
| 11 | Interfacing load cell, temperature sensors & PV cell with LabVIEW using an Arduino board. | 5-6-7 |  |  |
| 12 | Observe and experimentally validate the working of Smoke and Ethanol Sensor, their calibration, and data handling. | 1-4-6-7 |  |  |
| 13 | Observe and experimentally validate the working of Thermocouple & AD- 590, there calibration, and data handling. | 1-4-6-7 |  |  |
| 15 | Design-Oriented Project Work | 2-3-5-7 |  |  |
| 16 | Final Lab Exam | 1-4-5 |  |  |

**PAF- KARACHI INSTITUTE OF ECONOMICS & TECHNOLOGY**

**SPRING-2019**

**EE-3411 (LAB) Linear control system**

**Course : Linear Control System Lab**

***Credit Hours : 3+1***

**Course Code (L): EE-3411**

**Instructor: Engr. Bushra**

**Email Address:** [**bushra@pafkiet.edu.pk**](mailto:bushra@pafkiet.edu.pk)

**Contact Hours: 3 hours / week**

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**Objectives:**

The lab aims to build a comprehensive foundation in the analysis and design of control systems using different Hardware and Software tools such as MATLAB.

**Contents:**

Familiarization with Matlab-Simulink, modeling of linear dynamic electrical and mechanical systems via transfer functions, analyzing First and Second order systems, understanding the open loop response of DC motor and Temperature control system, design and implementation of continuous and discontinues controllers, Applying Ziegler-Nichols method for PID tuning, design methods using root-locus plots for Lag and lead compensator, Obtaining Bode plots of linear Circuits and the development of control techniques based on PID, using linear state or output feedback.

**Recommended Book:**

•. Control System Engineering by Norman S. Nise 6th Edition

**Reference Books:**

•. Modern Control Engineering by Katsuhiko Ogata 5th Edition

**Administrative Instructions:**

* According to institute policy, 80% attendance is mandatory to appear in the final examination but 100% will be expected. Approved leaves will not be considered towards attendance.
* Every student should bring calculator and manual in each lab.
* Every student is expected to be in lab before schedule starting time.

In design-oriented project work, the students deal with problems that can be solved by theories and knowledge they have acquired in their previous lectures. (Design Problems).

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| **Mapping of CLOs and PLOs** | | | |
| **Sr. No** | **Course Learning Outcomes** | **PLO’s** | **Bloom’s Taxonomy** |
| **CLO1** | Recall the associated concepts form theory regarding the Control system, their response, transfer function, error correction, and controller designing techniques. | **PLO1** | **C1** (Recall) |
| **CLO2** | Be able to model and analyze first and second order electrical and mechanical systems, Ball and Beam, Magnetic Levitation and Process control trainer by finding their transfer function, and their open loop and closed loop response by applying different test inputs (step, ramp etc.) | **PLO2** | **C4** (Analysis) |
| **CLO3** | Be able to model and simulate first and second order electrical and mechanical systems, Ball and Beam, Inverted Pendulum, Magnetic Levitation and Process control trainer by using Matlab and Simulink | **PLO5** | **P3**(Operate) |
| **CLO4** | Investigating the system behavior for Designing and computation of Compensators and Controllers, to meet desired system performance characteristics | **PLO4** | **P3** (Guided Response) |
| **CLO5** | Design/Develop solutions for complex engineering problems covered under the scope of this course. | **PLO3** | **P4** (Mechanism) |
| **CLO6** | Assume responsibility and the use of resources to complete the assigned task with proper Teamwork. | **PLO9** | **A3(**Assume responsibility**)** |
| **CLO7** | Properly handle lab infrastructure with safety precautions. | **PLO8** | **P2** (Set) |

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| **Assessment tools** | **CLO1** | **CLO2** | **CLO3** | **CLO4** | **CLO5** | **CLO6** | **CLO7** | **Assessment** |
| Lab Manual | 3% | 6.8% | 8.17% | 6% | 0% | 3% | 3% | 30% |
| Lab Exam | 0% | 10% | 5% | 10% | 0% | 0% | 5% | 30% |
| Lab Project | 0% | 0% | 0% | 0% | 35% | 5% | 0% | 40% |
| Total | 3% | 16.8% | 13.17% | 16% | 35% | 8% | 8% | 100% |

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| **Grading Policy** | |
| Lab Manual | 30% |
| Lab Exam | 30% |
| Lab Project | 40% |

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| No. | Lab Title | CLOs | Marks | Sign. |
| 1 | Introduction to MATLAB | CLO (1,3,6,7) |  |  |
| 2 | Modelling and Analysis of Electrical and Mechanical system | CLO (1,2,3,6,7) |  |  |
| 3 | Modeling and analysis of First Order Systems and their behavior at different inputs | CLO (1,2,3,6,7) |  |  |
| 4 | Modeling and analysis of Second Order Systems and their behavior at different inputs | CLO (1,2,3,6,7) |  |  |
| 5 | Introduction to ball and beam system. | CLO (1,2,3,6,7) |  |  |
| 6 | Understanding the open and close loop Response of DC Motor. | CLO (1,2,6,7) |  |  |
| 7 | On/Off controller design for temperature control system | CLO (1,4,6,7) |  |  |
| 8 | Proportional controller design for level control system. | CLO (1,2,3,4,6,7) |  |  |
| 9 | Applying Ziegler-Nichols PID tuning rule to control the position of Ball on the Beam. | CLO (1,3,4,6,7) |  |  |
| 10 | Lead Compensator design via root locus to for Inverted Pendulum system. | CLO (1,3,4,6,7) |  |  |
| 11 | Lag Lead Compensator Design via root locus for inverted pendulum system. | CLO (1,3,4,6,7) |  |  |
| 12 | Obtaining Bode plots of linear Circuits | CLO (1,2,3,6,7) |  |  |
| 13 | PID controller design for magnetic levitation system | CLO (1,3,4,6,7) |  |  |
| 14 | Design-Oriented Project Work | CLO (2,3,4,5,6) |  |  |
| 15 | Final Lab Exam | CLO (2,3,4,7) |  |  |

**PAF- KARACHI INSTITUTE OF ECONOMICS & TECHNOLOGY**

**SPRING-2018**

**MTE-4413 Sensors & actuators (LAB)**

**Course : Sensors and Actuators**

**Credit Hours *: 3+1***

**Course Code (L): MTE-4413**

**Instructor: Bushra**

**Email Address: bushra@pafkiet.edu.pk**

**Contact Hours: 3 hours / week**

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**Objectives:**

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| **Mapping of CLOs and PLOs** | | | |
| Sr. No | **Course Learning Outcomes** | **PLOs** | **Bloom’s Taxonomy** |
| CLO1 | Recall the associated concepts form theory regarding various sensors, actuators and signal Conditioning Circuits. | PLO1 | C1 (Recall) |
| CLO2 | Problem identification, followed by thorough analysis and literature review, resulting in meaningful conclusions | PLO2 | C3 (Apply) |
| CLO3 | Design/Develop solutions for complex engineering problems covered under the scope of this course. | PLO3 | P4 (Mechanism) |
| CLO4 | Observe and experimentally validate the working of various sensors, to measure physical quantities such as pressure, humidity etc. by conducting experiments in laboratory on real components, sensors and actuators. | PLO4 | P3 (Guided Response) |
| CLO5 | Examining the working and operation of signal conditioning circuits for the calibration of sensors | PLO5 | P3 ( Operate ) |
| CLO6 | Properly handle lab infrastructure with safety precautions | PLO8 | P2 (Set) |
| CLO7 | Assume responsibility and the use of resources to complete the assigned task with proper Teamwork | PLO9 | A3(Assume responsibility) |

The objective of this Lab is to help students understand the use of sensors, transducers and actuators. It

addresses operation and integration of a wide variety of transducers and actuators, and also discusses technical details and practical applications.

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| CLO Assessment Mechanism | | | | | | | | |
| Assessment tools | CLO1 | CLO2 | CLO3 | CLO4 | CLO5 | CLO6 | CLO7 | Assessment |
| Lab Manual | 3.99% | 0% | 0% | 19.341% | 8.596 % | 3.99% | 3.99% | 40% |
| Lab Exam | 0% | 0% | 0% | 15% | 10% | 5% | 0% | 30% |
| Lab Project | 0% | 10% | 15% | 0% | 0% | 0% | 5% | 30% |
| Total | 3.99% | 10% | 15% | 34.34% | 18.6% | 8.99% | 8.99% | 100% |

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| **Grading Policy** | |
| Lab Manual | 40% |
| Lab Exam | 30% |
| Lab Project | 30% |

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| No. | Lab Title | CLOs | Marks | Sign. |
| 1 | Practically analyze the operation of signal conditioning amplifiers | 1-5-6-7 |  |  |
| 2 | Practically analyze the operation of voltage to current, current to voltage, comparator, oscillator and electronic switch | 1-5-6-7 |  |  |
| 3 | Practically analyze the operation of summing amplifier, integrator, differentiator and sample and hold circuit. | 1-5-6-7 |  |  |
| 4 | Practically analyzing the null methods to measure unknown voltage and the effect of loading. | 1-5-6-7 |  |  |
| 5 | Practically analyze the operation and working of Temperature transducers. | 1-4-6-7 |  |  |
| 6 | Measurement of light intensity using photovoltaic cell, phototransistor photoconductive transducer, and PIN photodiode | 1-4-6-7 |  |  |
| 7 | Practically analysing the working and operation of Microphone, Moving Coil speaker and buzzer | 1-4-6-7 |  |  |
| 8 | Examine the function of LVDT, variable capacitor and strain gauges | 1-4-6-7 |  |  |
| 9 | Examine the operation of flow transducer, pressure transducer and water level transducer. | 1-4-6-7 |  |  |
| 10 | Experimental analysis and verification of Positional, rotational sensors and electrical actuators | 1-4-6-7 |  |  |
| 11 | Examine the Construction and working of basic pneumatic circuits. | 1-4-6-7 |  |  |
| 12 | Examine the operation of pneumatic components to perform basic logical operations (I) | 1-4-6-7 |  |  |
| 13 | Examine the operation of pneumatic components to perform basic logical operations (II) | 1-4-6-7 |  |  |
| 15 | Design-Oriented Project Work | 2-3-7 |  |  |
| 16 | Final Lab Exam | 4-5-6 |  |  |

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| Lab | Sensors and Actuator | | | | | | Student ID | | | | |  | | | | | |
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| PLOs | PLO1 – Engineering Knowledge | | | | | | Bloom’s  Taxonomy | | | | | C1 – Recall | | | | | |
| PLO2 – Problem Analysis | | | | | | C3 – Apply | | | | | |
| PLO3 – Design and Development | | | | | | P4 – Mechanism | | | | | |
| PLO4 – Investigation | | | | | | P3 – Guided Response | | | | | |
| PLO5 – Modern Tool Usage | | | | | | P3 – Operate | | | | | |
| PLO9 – Team Work | | | | | | A3 – Assume Responsibility | | | | | |
| PLO8 – Ethics | | | | | | P2 – Set | | | | | |
| PERFORMANCE PARAMETERS | | | | | | | | | | | | | | | | | |
| CLOs | Aspects of Assessments | Excellent  (75-100%) | | | | | Average  (50-75%) | | | | | Poor  (<50%) | | | | | |
| CLO1  PLO1 | Recall: Recall the associated concepts form theory regarding various sensors and signal Conditioning Circuits. | Complete understanding of the concepts / actively participate during lecture /read & interpret signal Conditioning Circuits. | | | | | Understand sensor(s) concepts / participates less in class / read conditioning circuits but unable to interpret accurately. | | | | | Student lacks clear understanding of sensor concepts/ Unable to read and interpret signal conditioning circuit completely. | | | | | |
| CLO2  PLO2 | Problem Analysis Problem identification, analysis /literature review, resulting in meaningful conclusions | Completely identifies the problem in question through efficient analysis/produces near to exact results | | | | | Partially identifies the problem in question and with academic support produces the required results. | | | | | Lack of identification of the problem, needing more than par support to analyze the problem and production of results. | | | | | |
| CLO3  PLO3 | Design & Development Design / Develop solutions for complex engineering problems covered under the scope of this course | A complete solution / Explain necessary theories according to task description with great use of time and resource material. | | | | | Solution was complete but need minor modifications / student could have followed specification more closely. | | | | | Solution was complete but did not work, needed several modifications / did not make correct use of resource material or instructions. | | | | | |
| CLO4  PLO4 | Experimental Validation Observe the working of various sensors and actuators. | Student efficiently observe / validate working by following Circuit diagram. | | | | | Observe the sensor behavior by following schematic diagram but with minor errors. | | | | | Sensor / Circuit working is validate accurately only with help from the teacher. | | | | | |
| Data Analysis Data Handling / Calculations / Plotting and Experimental Verifications. | Accurately does data analysis / plotting /correlate experimental results to expected theoretical values. | | | | | Conducts computations with minor error; and reasonably correlates results to known theoretical values. | | | | | Able to conduct analysis on collected data, no attempt to correlate experimental results with known theoretical values. | | | | | |
| CLO5  PLO5 | Tools Utilization Examining the working and operation of signal conditioning circuits for the calibration of sensors, and to design solutions for mechatronic applications | Successful calibration of sensors, and/or design solutions for mechatronics application. | | | | | Calibrate sensors and/ or design solutions for mechatronics application. | | | | | Does not know how to calibrate sensors or to design circuits for mechatronics application. | | | | | |
| CLO6  PLO8 | Lab Safety Properly handle lab infrastructure/ safety precautions | Properly handle lab equipment & obey safety measures. | | | | | Moderate level lab handling and safety measurements | | | | | Minor or no safety measurements has been considered. | | | | | |
| CLO7  PLO9 | Team Work Completion of Lab tasks with proper team work and contribution. | Proactively work with other team members to complete assigned tasks. | | | | | Worked well with team but did not offer much positive feedback. | | | | | Very little, if any, contributions to group and less contribution in completion of overall lab tasks. | | | | | |
| EVALUATION | | | | | | | | | | | | | | | | | |
| CLOs | Aspects of Assessments | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | F | P |
| CLO1 | Recall |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CLO2 | Problem Analysis |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CLO3 | Engineering Problem |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CLO4 | Experimental validation |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Data Analysis |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CLO5 | Modern Tools Usage |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CLO6 | Lab Safety |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CLO7 | Team Work |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Marks Obtained in Each Lab | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

**PAF- KARACHI INSTITUTE OF ECONOMICS & TECHNOLOGY**

**SPRING-2018**

**MTE-4420 (lab) Introduction to Robotics**

**Course: Introduction to robotics**

**Credit Hours *: 3 + 1***

**Course Code (L): MTE - 4420**

**Instructor: Bushra**

**Email Address:** [bushra@pafkiet.edu.pk](mailto:bushra@pafkiet.edu.pk)

**Contact Hours: 3 hours / week**

**Objectives:**

The objective of this course is to introduce students to the principles of robotics. This course deals with Denavit-Hartenberg coordinate transformation, position control through PID controller, path and trajectory planning using different manipulators.

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| **Mapping of CLOs and PLOs** | | | |
| Sr. No | **Course Learning Outcomes** | **PLOs** | **Bloom’s Taxonomy** |
| CLO1 | Recall the associated concepts form theory regarding the DH parametrization of Robotics arms, Forward Kinematics and Inverse Kinematics. | PLO1 | C1 (Recall) |
| CLO2 | Problem identification, followed by thorough analysis and literature review, resulting in meaningful conclusions | PLO2 | C3 (Apply) |
| CLO3 | Design/Develop solutions for complex engineering problems covered under the scope of this course. | PLO3 | P4 (Mechanism) |
| CLO4 | Investigating the working and operation of robots to apply robot navigation and path plaining techniques to perform various tasks, including the experimental validation of DH parametrization, forward kinematics and inverse kinematics. | PLO4 | P3 (Guided Response) |
| CLO5 | Examining the assembly and interfacing of Robotic kits (i.e. Lego kits, Zumo robots, robotic arm), with related software. | PLO5 | P3 ( Operate ) |
| CLO6 | Properly handle lab infrastructure with safety precautions. | PLO8 | P2 (Set) |
| CLO7 | Assume responsibility and the use of resources to complete the assigned task with proper Teamwork. | PLO9 | A3 (Assume responsibility) |

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| **CLO Assessment Mechanism** | | | |
| **Assessment tools** | **CLO\_1** | **CLO\_2** | **CLO\_3** |
| **Lab Manual** | 21.42 % | 8.57 % | 0 % |
| **Lab Exam** | 15 % | 15 % | 0 % |
| **Lab Project** | 0 % | 0 % | 40 % |

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| **Grading Policy** | |
| Lab Manual | 40% |
| Lab Exam | 30% |
| Lab Project | 30% |

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| **No.** | **Lab Title** | **CLOs** | **Marks** | **Sign** |
| 1 | Introduction to LEGO Mindstorms software with sensors and motor interfacing | CLO (5,6,7) |  |  |
| 2 | Line following and obstacle avoidance on multicolor arena | CLO(4,5,6,7) |  |  |
| 3 | Maze solver Robot | CLO(4,5,6,7) |  |  |
| 4 | Introduction to Zumo 32U4 and sensor interfacing | CLO (5,6,7) |  |  |
| 5 | Following object in front or face towards opponent of Zumo 32U4 | CLO(4,5,6,7) |  |  |
| 6 | Zumo 32U4 facing uphill and resist downward motion | CLO(4,5,6,7) |  |  |
| 7 | Zumo 32U4 resist Rotation and try to maintain its position | CLO(4,5,6,7) |  |  |
| 8 | Zumo 32U4 sumo competition | CLO (4,6,7) |  |  |
| 9 | Position tracking using Dead Reckoning with the help of encoders | CLO (4,6,7) |  |  |
| 10 | Familiarization with 3 DOF robotic arm, real time interfacing with Matlab and DH parametrization | CLO(1,4,5,6,7) |  |  |
| 11 | Forward kinematics | CLO(1,4,5,6,7) |  |  |
| 12 | Inverse Kinematics | CLO (1,4,5,6,7) |  |  |
| 13 | Basic task performance using robotic arm | CLO (1,4,5,6,7) |  |  |
| 14 | Design-Oriented Project Work | CLO(2,3,7) |  |  |
| 15 | Final Lab Exam | CLO (4,6,7) |  |  |

**PAF- KARACHI INSTITUTE OF ECONOMICS & TECHNOLOGY**

**SPRING-2018**

**EE-3327 (LAB) Power electronics**

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**Course: Power Electronics**

**Credit Hours *:* 3 + 1**

**Course Code (L): EE-3327**

**Instructor:**

**Email Address:**

**Contact Hours: 3 hours / week**

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**Objectives:**

The lab aims to cover modern techniques of Power Electronics that are critical to a wide variety of applications of practical interest. Special focus is laid on the design techniques of controlled rectifiers, power converter circuits & inverters.

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| **Mapping of CLOs and PLOs** | | | |
| Sr. No | **Course Learning Outcomes** | **PLOs** | **Bloom’s Taxonomy** |
| CLO1 | Recall the associated concepts form theory regarding various digital logic and signal Conditioning Circuits. | PLO1 | C1 (Recall) |
| CLO2 | Problem identification, followed by thorough analysis and literature review, resulting in meaningful conclusions | PLO2 | C3 (Apply) |
| CLO3 | Design/Develop solutions for complex engineering problems, making use of techniques used in labs to design a project. | PLO3 | P4 (Mechanism) |
| CLO4 | Observe and experimentally validate the working of various sensors, their calibration, and data handling. | PLO4 | P3 (Guided Response) |
| CLO5 | Properly handle lab infrastructure with safety precautions | PLO8 | P2 (Set) |
| CLO6 | Assume responsibility and the use of resources to complete the assigned task with proper Teamwork | PLO9 | A3(Assume responsibility) |

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| **CLO Assessment Mechanism** | | | | | | | |
| **Assessment tools** | **CLO1** | **CLO2** | **CLO3** | **CLO4** | **CLO5** | **CLO6** | **Assessment** |
| Lab Manual | 2.89% | 0% | 0% | 20.54% | 3.68% | 2.89% | 30% |
| Lab Exam | 10% | 0% | 0% | 18% | 1% | 1% | 30% |
| Lab Project | 5% | 15% | 15% | 0% | 5% | 0% | 40% |
| Total | 17.89% | 15% | 15% | 38.54% | 9.68% | 3.89ss% | 100% |

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| **Grading Policy** | |
| **Assessment Items** | **Percentage** |
| **Lab Manuals** | **30%** |
| **Lab Exam** | **30%** |
| **Project** | **40%** |

**Recommended Book:**

Power Electronics, by Daniel Hart

**Reference Book:**

Fundamental of Power Electronics by Robert Erickson

**Administrative Instructions:**

* Title and Group members name for Lab/Course project should be submitted by 4th week of lab.
* According to institute policy, 80% attendance is mandatory to appear in the final examination but 100% will be expected. Approved leaves will not be considered towards attendance.
* Every student should bring calculator and manual in each lab.
* Every student is expected to be in lab before schedule starting time.
* In design-oriented project work, the students deal with problems that can be solved by theories and knowledge they have acquired in their previous lectures. (Design Problems).

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| **No** | **Lab Title** | **CLOs** | **Marks** | **Sign.** |
| **1** | **Experimenting of DC power conversion through Switching circuits.** | **1-4-5-6** |  |  |
| **2** | **Switching characteristics of Silicon Controlled Rectifier.** | **1-4-5-6** |  |  |
| **3** | **Detecting Zero crossing in line input voltage and generating controlled firing signal for SCR.** | **1-4-5-6** |  |  |
| **4** | **Controlled Half wave Rectifier Circuit.** | **1-4-5-6** |  |  |
| **5** | **SCR based AC power Controller.** | **1-4-5-6** |  |  |
| **6** | **SCR based Full Wave Controlled Rectifier.** | **1-4-5-6** |  |  |
| **7** | **Design and Analysis of Buck Converter.** | **1-4-5-6** |  |  |
| **8** | **Design and Analysis of Boost Converter.** | **1-4-5-6** |  |  |
| **9** | **Design and Analysis of Buck Boost Converter.** | **1-4-5-6** |  |  |
| **10** | **Single Phase Square Wave Inverter.** | **1-4-5-6** |  |  |
| **11** | **Designing High Frequency Inductor for DC-DC Conversion.** | **1-4-5-6** |  |  |
| **12** | **Designing High Frequency Transformer for DC-DC Conversion.** | **1-4-5-6** |  |  |
| **13** | **Designing Closed Loop Buck Converter using IC LM2575.** | **1-4-5-6** |  |  |
| **14** | **Design-Oriented Project Work** | **1-2-3-6** |  |  |
| **15** | **Final Lab Exam** | **1-4-5-6** |  |  |

**PAF- KARACHI INSTITUTE OF ECONOMICS & TECHNOLOGY**

**SPRING-2019**

**MTE-4314 (LAB) Mechatronics system design (updated Sept 2019)**

**Course: Mechatronics System Design**

**Credit Hours *: 2 + 2***

**Course Code (L): MTE-4314**

**Instructor: Hamza Hamid Taimuri**

**Email Address: hamza.hamid@pafkiet.edu.pk**

**Contact Hours: 3 hours / week**

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**Objectives:**

The course is aimed at developing the student’s understanding about the synergistic interaction of electronic engineering, mechanical engineering, control systems and digital systems in system design and product manufacturing. The objective is to develop skills to find innovative solutions, manage multidisciplinary teams and work at all levels of an integrated engineering system.

**Contents:**

The course comprises of experiments and demonstrations related to calculation of Motor parameters, H-Bridge designing, Arduino programming, CAD/CAM modeling of Encoder and Gears, CNC Milling Machine part programming and cutting of Gears on CNC.

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| **CLO Assessment Mechanism** | | | | | | | | | |
| **Assessment tools** | **CLO1** | **CLO2** | **CLO3** | **CLO4** | **CLO5** | **CLO6** | **CLO7** | **CLO8** | **Assessment** |
| Lab Manual | 14.6% | 6.428% | 11.571% | 5.142% | 7.71% | 0% | 6.45% | 8.17% | 60% |
| Lab Project | 10% | 0% | 0% | 0% | 0% | 20% | 5% | 5% | 40% |
| Total | 24.6% | 6% | 11.14% | 6% | 7.71% | 20% | 11.45% | 13.17% | 100% |

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| **Grading Policy** | |
| Lab Manuals | 60% |
| Lab Project | 40% |
| Total | 100% |

**Text Books:**

1. Mechatronics: Electronic control systems in mechanical and electrical engineering, 4th Edition, by **W. Bolton.**
2. Mechatronics System Design, 2nd Edition, by **Devdas Shetty.**

**Reference Books:**

1. Modern Control Systems Analysis and Design Using MATLAB, by **Richard H Bishop.**
2. Introduction to Simulink with Engineering Applications, May 26, 2006, by **Steven T. Karris.**
3. Microcontroller Based Applied Digital Control, by **DoganEbrahim.**

**Administrative Instructions:**

* According to institute policy, 80% attendance is mandatory to appear in the final examination but 100% will be expected. Approved leaves will not be considered towards attendance.
* Every student should bring calculator and manual in each lab.
* Every student is expected to be in lab before schedule starting time.

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| **Mapping of CLOs and PLOs** | | | |
| **Sr. No** | **Course Learning Outcomes** | **PLOs** | **Bloom’s Taxonomy** |
| CLO1 | Recall the associated concepts form theory regarding electronics, control systems, embedded systems, programming and CAD/CAM modeling. | PLO1 | C1 (Recall) |
| CLO2 | Conduct the basic experiment to determine the parameters for modeling and design electronics circuits to perform requisite tasks. | PLO4 | P3 (Guided Response) |
| CLO3 | Use embedded systems to design solutions to solve problems. | PLO4 | P3 (Guided Response) |
| CLO4 | Utilize SolidWorks to design gear trains. | PLO4 | P3 (Guided Response) |
| CLO5 | Utilize the CNC programming concepts to develop parts according to the standards. | PLO4 | P3 (Guided Response) |
| CLO6 | Design/Develop solutions for complex engineering problems covered under the scope of this course and lab. | PLO3 | P4 (Mechanism) |
| CLO7 | Properly handle lab infrastructure with safety precautions. | PLO8 | P2 (Set) |
| CLO8 | Assume responsibility and the use of resources to complete the assigned task with proper Teamwork. | PLO9 | A3(Assume responsibility) |

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| Lab | Mechatronics System Design | | | | | | | | | Student ID | | | | | |  | | |
| PLOs | PLO1 – Engineering Knowledge | | | | | | | | | Bloom’s  Taxonomy | | | | | | C1 – Recall | | |
| PLO3 – Design and Development | | | | | | | | | P4 – Mechanism | | |
| PLO4 – Investigation | | | | | | | | | P3 – Guided Response | | |
| PLO8 – Ethics | | | | | | | | | P2 – Set | | |
| PLO9 – Team Work | | | | | | | | | A3 – Assume Responsibility | | |
|  | PERFORMANCE PARAMETERS | | | | | | | | | | | | | | | | | |
| CLOs | Aspects of Assessments | | Excellent  (75-100%) | | | | | | | Average  (50-75%) | | | | | | Poor  (<50%) | | |
| CLO1  PLO1 | Recall: Recall the associated concepts form theory regarding electronics, control systems, embedded systems, programming and CAD/CAM modeling. | | Complete understanding of the concepts / actively participate during lecture /read & interpret electronics, control systems, embedded systems, programming and CAD/CAM modeling. | | | | | | | Understand thermodynamics and heat transfer concepts / participates less in class / read electronics, control systems, embedded systems, programming and CAD/CAM modeling but unable to interpret accurately. | | | | | | Student lacks clear understanding of thermodynamics and heat transfer concepts/ Unable to read and interpret electronics, control systems, embedded systems, programming and CAD/CAM modeling completely. | | |
| CLO2  PLO4 | Experimental Validation Conduct the basic experiment to determine the parameters for modeling and design electronics circuits to perform requisite tasks. | | Student efficiently observe / validate parameters for modeling and design electronics circuits to perform requisite tasks. | | | | | | | Observe the parameters for modeling and design electronics circuits to perform requisite tasks but with minor errors. | | | | | | The determination of parameters for modeling and design electronics circuits to perform requisite tasks is validate accurately only with help from the teacher. | | |
| Data Analysis Data Handling / Calculations and Experimental Verifications. | | Accurately does data analysis / plotting /correlate experimental results to expected theoretical values. | | | | | | | Conducts computations with minor error; and reasonably correlates results to known theoretical values. | | | | | | Able to conduct analysis on collected data, no attempt to correlate experimental results with known theoretical values. | | |
| CLO3  PLO4 | Experimental Validation  Use embedded systems to design solutions to solve problems. | | Student efficiently observe / validate the embedded systems to design solutions to solve problems. | | | | | | | Observe the embedded systems to design solutions to solve problems but with minor errors. | | | | | | Using the embedded systems to design solutions to solve problems is validate accurately only with help from the teacher. | | |
| CLO4  PLO4 | Experimental Validation  Utilize SolidWorks to design gear trains. | | Student efficiently observe / validate the SolidWorks to design gear trains. | | | | | | | Observe the SolidWorks to design gear trains but with minor errors. | | | | | | Utilizing the SolidWorks to design gear trains is validate accurately only with help from the teacher. | | |
| CLO5  PLO4 | Experimental Validation  Utilize the CNC programming concepts to develop parts according to the standards. | | Student efficiently observe / validate the CNC programming concepts to develop parts according to the standards. | | | | | | | Observe the CNC programming concepts to develop parts according to the standards but with minor errors. | | | | | | Utilizing the CNC programming concepts to develop parts according to the standards is validate accurately only with help from the teacher. | | |
| CLO6  PLO3 | Design & Development Design / Develop solutions for complex engineering problems covered under the scope of this course and lab | | A complete solution / Explain necessary theories according to task description with great use of time and resource material. | | | | | | | Solution was complete but need minor modifications /student could have followed specification more closely. | | | | | | Solution was complete but did not work, needed several modifications / did not make correct use of resource material or instructions. | | |
| CLO7  PLO8 | Lab Safety Properly handle lab infrastructure/ safety precautions | | Properly handle lab equipment & obey safety measures. | | | | | | | Moderate level lab handling and safety measurements | | | | | | Minor or no safety measurements has been considered. | | |
| CLO8  PLO9 | Team Work Completion of Lab tasks with proper team work and contribution. | | Proactively work with other team members to complete assigned tasks. | | | | | | | Worked well with team but did not offer much positive feedback. | | | | | | Very little, if any, contributions to group and less contribution in completion of overall lab tasks. | | |
|  | EVALUATION | | | | | | | | | | | | | | | | | |
| CLOs | Aspects of Assessments | 1 | | 2 | 3 | 4 | 5 | 6 | 7 | | 8 | 9 | 10 | 11 | 12 | 13 | 14 | Project |
| CLO1 | Recall |  | |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| CLO2 | Experimental validation |  | |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| Data Analysis |  | |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| CLO3 | Experimental validation |  | |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| Data Analysis |  | |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| CLO4 | Experimental validation |  | |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| Data Analysis |  | |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| CLO5 | Experimental validation |  | |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| Data Analysis |  | |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| CLO6 | Engineering Problem |  | |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| CLO7 | Lab Safety |  | |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| CLO8 | Team Work |  | |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |
| Marks Obtained in Each Lab | |  | |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |

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| **No.** | **Lab Title** | **CLOs** | **Marks** | **Sign.** |
| 1 | Introduction to Design Project & formation of groups. | 1-8 |  |  |
| 2 | Determination of Motor Parameters  Motor Resistance  Motor Voltage K  Back EMF Constant  Motor Inductance  Motor Stall Current Measurement  Motor Stall Torque  Max Speed at Rated Voltage  Motor no load Inertia | 1-2-7-8 |  |  |
| 3 | Design the H-Bridge Circuit  Design of Circuit  Construction of Circuit  Component Placement  Quality of Soldering  Aesthetics  Software Simulations  Comparison Table  Testing Results | 1-2-7-8 |  |  |
| 4 | Arduino Familiarization  Pre LAB Task  Blink LED  Fading LED | 1-3-7-8 |  |  |
| 5 | Arduino Core Programming Concepts  Pre LAB Task Review Lab 3  Pre LAB Task Acquire Electronic Hardware Components  Programming Concepts  Operators  Control Statements  Loops  Functions  Function Libraries | 1-3-7-8 |  |  |
| 6 | Arduino Pulse Width Modulation Programming beyond 32kHz  Pre LAB Task Review analogwrite function  Pulse Width Modulation  Pre lab Timer1.h in depth study of the code.  Pulse Width Modulation | 1-3-7-8 |  |  |
| 7 | Arduino – Interrupts & High Speed Interrupts  Understanding Interrupts  Types  Attachinterrupt  High Speed Interrupts  Encoder Interface  Calibration | 1-3-7-8 |  |  |
| 8 | Encoder Readout Circuit Design  Design of Circuit  Software Simulations  Comparison Table | 1-2-3-7-8 |  |  |
| 9 | Mechanical Design of Encoder Assembly  Pre LAB Task Review of Readout Specs  Mechanical Design  Assembly drawing  Sensor Placement | 1-4-7-8 |  |  |
| 10 | Introduction to Gears & determine its parameters  Introduction to Gears  Classification of Gears  Characteristics of Gears  Gear Terminologies  Gear Ratio  Output Angular Velocity in RPM  Output Torque  Remaining Parameters | 1-8 |  |  |
| 11 | CAD Modeling of Gears Using SolidWorks Toolbox | 1-4-7-8 |  |  |
| 12 | Introduction to CNC Milling Machine | 5-7-8 |  |  |
| 13 | CNC Part Programming  Generate the G-Codes of gears  Generate the M-Codes of gears | 5-7-8 |  |  |
| 14 | Spur Gear Cutting in CNC Milling Machine | 5-7-8 |  |  |
| 15 | Design-Oriented Project Work Evaluation | 1-6-7-8 |  |  |

**PAF- KARACHI INSTITUTE OF ECONOMICS & TECHNOLOGY**

**SPRING-2018**

**EE-4321 (LAB) Industrial control &automation**

**Course: Industrial Control and Automation**

**Credit Hours*: 2+1***

**Course Code (L): EE-4321**

**Instructor:**

**Email Address:**

**Contact Hours: 3 hours / week**

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**Objectives:**

* Using the Ladder Logic to understand the basic concepts and working techniques of Industrial Control Systems.
* Hand’s on tasks for Programmable Logic Controller, Sensors and Variable Frequency Drives in Laboratory.

**Contents:**

* 1. Industrial Control Systems
  2. AC/DC Drives
  3. Programmable Logic Controllers.

**Learning Outcomes:**

On completion of course students should be able to:

1. Understand the fundamentals of Industrial Control & Automation.
2. Understanding the concept of system design for Industrial control applications.
3. Analyze and design problem-solving solutions for the Industrial control applications

Linear state or output feedback.

|  |  |  |  |
| --- | --- | --- | --- |
| **Mapping of CLOs and PLOs** | | | |
| **Sr.No** | **Course Learning Outcomes** | **PLOs** | **Bloom’s Taxonomy** |
| **CLO1** | Recall the associated concepts form theory regarding logic gates, truth tables, Karnaugh map, differences b/w an analogue and digital signal, PWM and Duty Cycle and the functioning of transistors, relays, 3ϕ Induction Motors and switch gears. | **PLO1** | **C1** (Recall) |
| **CLO2** | Understand the given problem related to industrial scenarios and use the recalled engineering knowledge to formulate solutions in terms of ladder diagrams | **PLO2** | **C4** (Analysis) |
| **CLO3** | Understand the given problem linked to a certain industrial scenario and efficiently works on WPL-Soft and DOP-soft to produce appropriate ladder diagram and HMI screen. | **PLO5** | **C3**(Apply) |
| **CLO4** | Design/Develop solutions for the given problems. | **PLO3** | **P4** (Mechanism) |
| **CLO5** | Assume responsibility and the use of resources to complete the assigned task with proper Teamwork. | **PLO9** | **A3(**Assume responsibility**)** |
| **CLO6** | Properly handle lab infrastructure with safety precautions. | **PLO8** | **P2** (Set) |

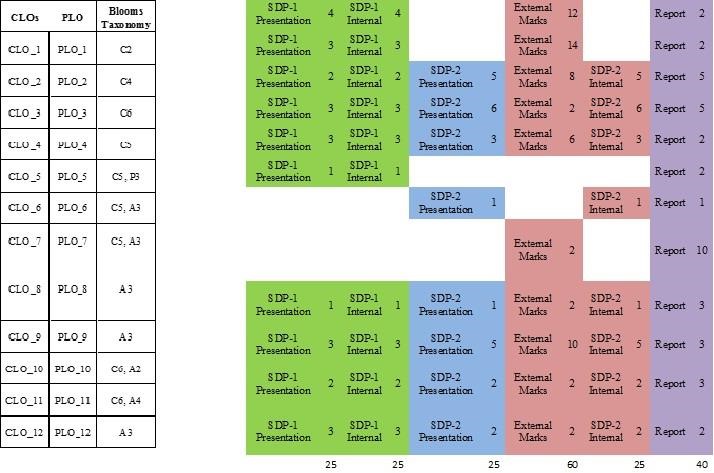
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| **Assessment tools** | **CLO1** | **CLO2** | **CLO3** | **CLO4** | **CLO5** | **CLO6** | **Assessment** |
| Lab Manual | 3.68% | 13.87% | 8.77% | 0% | 1.89% | 1.89% | 30% |
| Lab Exam | 0% | 10% | 15% | 0% | 0% | 5% | 30% |
| Lab Project | 0% | 0% | 10% | 25% | 5% | 0% | 40% |
| Total | 3.68% | 23.87% | 33.77% | 25% | 6.8% | 6.89% | 100% |

|  |  |
| --- | --- |
| Grading Policy | |
| Lab Manual | 30% |
| Lab Exam | 30% |
| Lab Project | 40% |

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| --- | --- | --- | --- | --- |
| **No.** | **Lab Title** | **CLOs** | **Marks** | **Sign.** |
| 1 | Logic Operations Using Delta WPL-Soft | CLO (1,2,3,6,7) |  |  |
| 2 | Implementation of Industrial Scenarios using WPL-Soft | CLO (2,3,6,7) |  |  |
| 3 | Using Timers and Set/Re-Set Coils | CLO (2,3,6,7) |  |  |
| 4 | Industrial Scenarios Based on Timers and Set/Re-set Coils | CLO (2,3,6,7) |  |  |
| 5 | Introduction to Counters in WPL-Soft. | CLO (2,3,6,7) |  |  |
| 6 | Generating a PWM in WPL-Soft. | CLO (1,2,3,6,7) |  |  |
| 7 | Control of 3-Phase Induction Motor using Variable Frequency Drive | CLO (1,2,3,6,7) |  |  |
| 8 | An Introduction to Delta HMI (Human Machine Interface). | CLO (2,3,6,7) |  |  |
| 9 | To use Analog Input and Output module and interface potentiometer and analog voltmeter with the PLC. | CLO (1,3,6,7) |  |  |
| 10 | Interface High Speed Inputs using Rotary Encoder (Optical) and external Sensors (Proximity). | CLO (2,3,6,7) |  |  |
| 11 | Controlling the speed of 3ϕ AC Motor using the Analogue Input/output Module. | CLO (1,2,3,6,7) |  |  |
| 12 | Interfacing a Switch Gear with PLC. | CLO (1,2,3,6,7) |  |  |
| 13 | VFD/HMI Control using RS485 Interfacing Bus. | CLO (2,3,6,7) |  |  |
| 14 | Design-Oriented Project Work | CLO(3, 5,6) |  |  |
| 15 | Final Lab Exam | CLO (2,3,7) |  |  |

# ANNEXURE-G4 (Senior Design Project CLO/PLO mapping and Rubrics)

|  |  |  |  |
| --- | --- | --- | --- |
| **CLOs** | **Description** | **PLO** | **Blooms Taxonomy** |
| CLO\_1 | A comprehensive understanding of the courses related to the project enabling students to foresee the main challenges and their possible solutions. | PLO\_1 | C2 |
| CLO\_2 | An ability to justify scope of the project, using first principles of mathematics and natural sciences. | PLO\_2 | C4 |
| CLO\_3 | An ability to transform ideas into practical solutions which can meet the desired specifications | PLO\_3 | C6 |
| CLO\_4 | A comprehensive evaluation of the design, involving investigation through experiments, simulation, or statistical tools. | PLO\_4 | C5 |
| CLO\_5 | An ability to utilize modern IT tools in the feasibility or the development phases (design, testing, debugging, and optimization) of the project. | PLO\_5 | C5, P3 |
| CLO\_6 | Students should be well aware of the cultural, economic, and social effects of their designs and should make an attempt to address them in their projects. | PLO\_6 | C5, A3 |
| CLO\_7 | Students should have an understanding of the environmental impact of their projects and should be able to justify the sustainability of their designs. | PLO\_7 | C5, A3 |
| CLO\_8 | While presenting their work, students should maintain ethical standards of research and development. Students should be well aware that forging/making-up results or exaggerating the actual contribution, result in violation of research ethics. | PLO\_8 | A3 |
| CLO\_9 | Each student in a group should exhibit skills required for a team to work efficiently. This may include switching roles from the team lead to a supporting role depending upon the nature of task. | PLO\_9 | A3 |
| CLO\_10 | An ability to effectively explain their work and contribution in the form of oral presentations and a technical report. | PLO\_10 | A2 |
| CLO\_11 | Students should exhibit effective management skills during the course of the project, meeting strict deadlines, prioritizing the critical tasks, time and funds management. | PLO\_11 | A4 |
| CLO\_12 | The proposed project should have scope for enhancements or possibly the potential to get converted into a commercial product, keeping students interested in the areas of research and development even after their graduation. | PLO\_12 | A3 |



  **SENIOR DESIGN PROJECT-I**

**PROJECT INTERMEDIATE PRESENTATION (PPT-1)-Evaluation Sheet (Advisor),**

**College of Engineering**

**Fall-2019 (Spring-2016 Batch), BE MECHATRONICS ENGINEERING PROGRAM**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Project Title** |  |  | **Project advisor** |  |
| **Depart Ref No** | **KIET/ME/SDP/FALL-2019/001** |  | **Project coadvisor** |  |
| **Scheduled Date** |  | **Room Syndicate** |  | |

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| **Student Name** | **Student ID** | **Student Name** | **Student ID** |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Assessment** | **Max**  **Mark s** | **SID**  **:** | **SID**  **:** | **SID**  **:** | **Excellent 80-100%** | **Good 60-80%** | **Satisfactory 40-60%** | **Poor Below 40%** |
| CLO1 | **Engineering**  **Knowledge**  The student has the ability to apply the knowledge of the math, science, and engineering specialization to the solution of complex engineering problems. | 4 |  |  |  | Strong concepts and in-depth  knowledge have been  demonstrate d | Can provide sound  justification of their  understandin g | Have scattered knowledge , but can  develop links  with guided questions | Can’t justify their  understanding if questioned. |
| CLO2 | **Problem Analysis** Principles of engineering are thoroughly applied to address the targeted complex engineering problem in reaching substantial conclusion and are supported by the state-of-art research. | 3 |  |  |  | Thorough application of  engineering  principles is demonstrate d reaching concrete  conclusion  supported by the state-ofart research. | Adequate engineering  principles are applied to reach  reasonable  conclusion backed by authentic research | Limited  Analysis is done with too many  assumptions and weak  citations of prior art. | Inconclusive analysis  provided, mainly  utilizing hit and trial approach |
| CLO3 | **Design/Developme nt of Solution**  Proposed design fulfills most of the requirements with some recommended improvements and | 2 |  |  |  | A systematic approach is used to  develop  solution  covering all the aspects, | The solution covers most of the  requirement  but does not  fully comply with existing | The design is lacking some necessary  features which are required  for the safety, conservation | The design followed poor engineering  approach is highly deficient to |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | complies with existing standards of respective field and fulfills all requirements including safety, conservation and economics. |  |  |  |  | which  complies  with existing standards. | standard and need  improvement  s. | and economic concerns | meet current  standards. |
| CLO4 | **Investigation**  The complex  engineering  problem and its solutions were  properly investigated in a methodical way. Valid conclusions have been derived after testing multiple case studies and conditions. | 3 |  |  |  | A broad and conclusive  investigation of the  problem and its solutions  is carried out  following a proper  methodolog  y | Most of the steps of  methodical  investigation  are covered.  However More case studies are  needed to draw  authentic conclusion | There is room for a lot of  improvement  in  experimentatio n and testing which may affect their conclusions. | Methodical investigation is not  followed with inconclusive findings. |
| CLO5 | **Modern Tool**  **Usage**  The student utilized modern engineering tools, techniques and available resources to develop a mathematical model of the  engineering problem. | 3 |  |  |  | Most relevant IT tools are  utilized with proper  understandin g of their limitations. | Selection of  IT tools is appropriate  however; its potentials  have not be  explored and applied fully. | IT tool usage is trivial with  and necessary  familiarization is lacking | Modern Tools selection and usage is  incorrect or entirely absent. |
| CLO6 | **The Engineer and Society**  Student has explored and is well aware of possible social, economical and cultural effects (if any) of the  complex  engineering  problem, and an attempt is made to address them in their designed solution. | 1 |  |  |  | Exploration of possible social,  economical  and cultural effects is  carried out and clear  attempts are made to address them. | Social, economical  and cultural effects are  surveyed and only  suggestions are made to address them. | At least some  Social, economical  and cultural effects are  surveyed, but no attempts are made to address them. | Students are unaware of  Social, economical  and cultural effects. |
| CLO9 | **The Individual and**  **Team Work**  Student demonstrated his/her ability and work as an | 1 |  |  |  | Each member  acknowledg es and is  well aware of the tasks | Good  individual  and well as  team work is demonstrated | Individual work is carried  out properly but lacks support provided to | No support in effort of  others is shown. |
|  | individual and/or in team to efficiently carry out tasks. |  |  |  |  | carried out  individually and as team. | in most of the task. | other member of Team. |  |
| CLO1  0 | **Communication**  Student was able to clearly explain his/her work contribution.  Effective use of charts, graphs, figures etc. Dressed in highly  professional manner. | 3 |  |  |  | Use of very fluent  speech.  Effective use of charts, graphs,  figures etc.  Dressed in highly  professional manner. | Confident speech. Fair  use of charts, graphs,  figures etc.  Generally well groomed and  professional. | Limited use of charts, graphs, figures etc.  Dressed neatly but casual. | Monotone voice.  Information in unstructured  way. Dressed  inappropriatel  y. |
| CLO1  1 | **Project**  **Management**  Student exhibits management skills through effective project planning, budget utilization, task scheduling and meeting deadlines. | 2 |  |  |  | Project has a proper  breakdown in tasks.  With optimal  utilization of budget. | Most Tasks  are  completed as  planned and  Proper utilization of budget is  demonstrated  . | Most deadlines are not meet and  many changes are made in  Project plan. | Project is poorly  managed and budget is utilized inefficiently. |
| CLO1  2 | **Life Long**  **Learning**  The student recognized his/her project as Industry or Academia funded project/Future commercialization potential/Innovative research aspect. | 3 |  |  |  |  |  |  |  |
|  | **Total marks** | **25** |  |  |  |  |  |  |  |

Evaluator Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Evaluator Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Remarks**



**SENIOR DESIGN PROJECT-I**

**PROJECT INTERMEDIATE PRESENTATION (PPT-1)-Evaluation Sheet (Internal),**

**College of Engineering**

**Fall-2019 (Spring-2016 Batch), BE MECHATRONICS ENGINEERING PROGRAM**

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| --- | --- | --- | --- | --- |
| **Project Title** |  |  | **Project advisor** |  |
| **Depart Ref No** | **KIET/ME/SDP/FALL-2019/001** |  | **Project coadvisor** |  |
| **Scheduled Date** |  | **Room Syndicate** |  | |

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| **Student Name** | **Student ID** | **Student Name** | **Student ID** |
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|  | **Assessment** | **Max**  **Mark s** | **SID**  **:** | **SID**  **:** | **SID**  **:** | **Excellent 80-100%** | **Good 60-80%** | **Satisfactory 40-60%** | **Poor Below 40%** |
| CLO1 | **Engineering**  **Knowledge**  The student has the ability to apply the knowledge of the math, science, and engineering specialization to the solution of complex engineering problems. | 4 |  |  |  | Strong concepts and in-depth  knowledge have been  demonstrate d | Can provide sound  justification of their  understandin g | Have scattered knowledge , but can  develop links  with guided questions | Can’t justify their  understanding if questioned. |
| CLO2 | **Problem Analysis** Principles of engineering are thoroughly applied to address the targeted complex engineering problem in reaching substantial conclusion and are supported by the state-of-art research. | 3 |  |  |  | Thorough application of  engineering  principles is demonstrate d reaching concrete  conclusion  supported by the state-ofart research. | Adequate engineering  principles are applied to reach  reasonable  conclusion backed by authentic research | Limited  Analysis is done with too many  assumptions and weak  citations of prior art. | Inconclusive analysis  provided, mainly  utilizing hit and trial approach |
| CLO3 | **Design/Developme nt of Solution**  Proposed design fulfills most of the requirements with some recommended improvements and | 2 |  |  |  | A systematic approach is used to  develop  solution  covering all the aspects, | The solution covers most of the  requirement  but does not  fully comply with existing | The design is lacking some necessary  features which are required  for the safety, conservation | The design followed poor engineering  approach is highly deficient to |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | complies with existing standards of respective field and fulfills all requirements including safety, conservation and economics. |  |  |  |  | which  complies  with existing standards. | standard and need  improvement  s. | and economic concerns | meet current  standards. |
| CLO4 | **Investigation**  The complex  engineering  problem and its solutions were  properly investigated in a methodical way. Valid conclusions have been derived after testing multiple case studies and conditions. | 3 |  |  |  | A broad and conclusive  investigation of the  problem and its solutions  is carried out  following a proper  methodolog  y | Most of the steps of  methodical  investigation  are covered.  However More case studies are  needed to draw  authentic conclusion | There is room for a lot of  improvement  in  experimentatio n and testing which may affect their conclusions. | Methodical investigation is not  followed with inconclusive findings. |
| CLO5 | **Modern Tool**  **Usage**  The student utilized modern engineering tools, techniques and available resources to develop a mathematical model of the  engineering problem. | 3 |  |  |  | Most relevant IT tools are  utilized with proper  understandin g of their limitations. | Selection of  IT tools is appropriate  however; its potentials  have not be  explored and applied fully. | IT tool usage is trivial with  and necessary  familiarization is lacking | Modern Tools selection and usage is  incorrect or entirely absent. |
| CLO6 | **The Engineer and Society**  Student has explored and is well aware of possible social, economical and cultural effects (if any) of the  complex  engineering  problem, and an attempt is made to address them in their designed solution. | 1 |  |  |  | Exploration of possible social,  economical  and cultural effects is  carried out and clear  attempts are made to address them. | Social, economical  and cultural effects are  surveyed and only  suggestions are made to address them. | At least some  Social, economical  and cultural effects are  surveyed, but no attempts are made to address them. | Students are unaware of  Social, economical  and cultural effects. |
| CLO9 | **The Individual and**  **Team Work**  Student demonstrated his/her ability and work as an | 1 |  |  |  | Each member  acknowledg es and is  well aware of the tasks | Good  individual  and well as  team work is demonstrated | Individual work is carried  out properly but lacks support provided to | No support in effort of  others is shown. |
|  | individual and/or in team to efficiently carry out tasks. |  |  |  |  | carried out  individually and as team. | in most of the task. | other member of Team. |  |
| CLO1  0 | **Communication**  Student was able to clearly explain his/her work contribution.  Effective use of charts, graphs, figures etc. Dressed in highly  professional manner. | 3 |  |  |  | Use of very fluent  speech.  Effective use of charts, graphs,  figures etc.  Dressed in highly  professional manner. | Confident speech. Fair  use of charts, graphs,  figures etc.  Generally well groomed and  professional. | Limited use of charts, graphs, figures etc.  Dressed neatly but casual. | Monotone voice.  Information in unstructured  way. Dressed  inappropriatel  y. |
| CLO1  1 | **Project**  **Management**  Student exhibits management skills through effective project planning, budget utilization, task scheduling and meeting deadlines. | 2 |  |  |  | Project has a proper  breakdown in tasks.  With optimal  utilization of budget. | Most Tasks  are  completed as  planned and  Proper utilization of budget is  demonstrated  . | Most deadlines are not meet and  many changes are made in  Project plan. | Project is poorly  managed and budget is utilized inefficiently. |
| CLO1  2 | **Life Long**  **Learning**  The student recognized his/her project as Industry or Academia funded project/Future commercialization potential/Innovative research aspect. | 3 |  |  |  |  |  |  |  |
|  | **Total marks** | **25** |  |  |  |  |  |  |  |

Evaluator Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Evaluator Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Remarks**

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**SENIOR DESIGN PROJECT-II**

###### PROJECT FINAL PRESENTATION (PPT-2)-Project Advisor Evaluation Sheet,

###### College of Engineering

**Fall-2019 (Spring-2016 Batch), BE MECHATRONICS ENGINEERING PROGRAM**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Project Title** |  |  | **Project advisor** |  |
| **Depart Ref No** | **KIET/ME/SDP/FALL-2019/001** |  | **Project coadvisor** |  |
| **Scheduled Date** |  | **Room Syndicate** |  | |

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| --- | --- | --- | --- |
| **Student Name** | **Student ID** | **Student Name** | **Student ID** |
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|  | **Assessment** | **Max**  **Mar ks** | **SI**  **D:**  **809**  **4** | **SI D:**  **809**  **7** | **SI D:** | **Excellent 81-100%** | **Good 61-80%** | **Satisfactor y**  **41-60%** | **Poor**  **Below**  **40%** |
| CLO  3 | **Design/Develop ment of Solution** Proposed design fulfills most of the requirements with some  recommended improvements and complies with existing standards of respective field and fulfills all requirements including safety, conservation and economics. | 5 |  |  |  | A systematic approach is used to  develop  solution  covering all  the aspects, which  complies with existing standards. | The solution covers most of the  requirements but does not fully comply with existing standard and need improvements. | The design is lacking some  necessary features  which are  required for the safety,  conservation and  economic concerns. | The design followed poor  engineering  approach that is  highly  deficient to  meet current standards. |
| CLO  4 | **Investigation**  The complex engineering problem and its solutions were properly investigated in amethodical way. Valid  conclusions have been derived after testing multiple | 6 |  |  |  | A broad and conclusive  investigation  of the problem and its  solutions is carried out  following a proper methodology | Most of the steps of methodical  investigation are  covered. However,  more case studies are needed to draw appropriateconclusion | There is need of  more  improvemen  ts in  experimentat ion and  testing  which may affect their conclusions. | Methodical investigation is not  followed with  conclusive findings. |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | case studies and conditions. |  |  |  |  |  |  |  |  |
| CLO  5 | **Modern Tool**  **Usage**  The student utilized modern engineering tools, techniques and  available  resources to develop a  mathematical  model of the  engineering problem. | 3 |  |  |  | Most of the relevant modern  engineering  tools/techniqu es are utilized  to develop the proposed  mathematical model. | The selection of modern engineering  toolis appropriate.  However, its potentials have not been explored and applied fully. | Modern engineering  tool usage is trivial and necessary  familiarizati on is lacking. | Modern engineering tool  selection  and usage is  incorrect or entirely absent. |
| CLO  7 | **Environment &**  **Sustainability**  Students should have an understanding of the societal and environmental impact of their engineering  project solutions and should be able to justify the sustainability of their designs. | 1 |  |  |  | Students have well  exploredthe possible  societal and  environmental impactsof  their solutions and have  demonstrated clearly the  sustainable development. | Students have adequate  understanding of societal and  environmental  impacts but are  unable to demonstrate the sustainable development. | At least students are  aware about  environment  al impacts and  sustainable  development of their  proposed solutions. | Students are unaware of  environment impacts and sustainable  development of their  proposed solutions. |
| CLO  9 | **The Individual**  **and Team Work**  Student demonstrated his/her ability and work as an individual and/or in team to efficiently carry out tasks. | 1 |  |  |  | Student acknowledges and is well  aware of the  tasks carried out  individually and as team. | Adequate individual as well as team work is demonstrated in most of the tasks. | Individual work is  carried out  properly but lacks  support  provided to other  members of Team. | Demonstrate d very poor ability to  work in both individual and team. |
| CLO  10 | **Communication** Student was able to clearly explain his/her work contribution. Effective use of charts, graphs, figures etc.  Dressed in highly professional manner. | 5 |  |  |  | The contribution was  demonstrated fluently and clearly with  effective use of charts,  graphs, figures etc. Dressed in highly  professional manner. | The contribution was demonstrated with  confident speech and fair use of charts,  graphs, figures etc.  Generally, showedwell-groomed and professional. | The contribution was  demonstrate d with  average  speech skills  and limited use of  charts,  graphs,  figures etc.  Dressed neatly but casual. | Monotone voice and  unstructured flow of  explanation shows poor  communicat ion skills.  Dressed inappropriat ely. |
| CLO  11 | **Project**  **Management** | 2 |  |  |  | All the project tasks are | Demonstrated good management skills. | Most deadlines are | Project is poorly |
|  | Student exhibits management skills through effective project planning, budget utilization, task scheduling and  meeting deadlines. |  |  |  |  | managed  professionally with  optimalplanni ng, budget  utilization, task  breakdowns  and meeting  deadlines. | Most tasks are completed with  appropriate planning, budget and deadlines. | not met and many  changes are made in the project plan. | managed.  Most tasks are  accomplishe d with  inefficient planning,  budget, and deadlines set. |
| CLO  12 | **Life Long**  **Learning**  The student  recognized his/her project as  Industry or  Academia funded project/Future commercializatio n potential/Innovat  ive research aspect. | 2 |  |  |  | The solid evidence is  provided that project is  funded by any  industry/agenc y or at least project is  innovative, and has  potential for future  commercializa  tion / research use. | The project is funded by any industry/agency or at least project is  innovative with  limited future  commercialization/res earch use. | The project  is funded by any  industry/age ncy or at  least project is minor  innovative  with no future scope/goals. | The project is neither  funded by any  industry/age ncy or at  least project is  innovative, nor has future scope/goals. |
|  | **Total marks** | **25** |  |  |  |  |  |  |  |

Advisor Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Advisor Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Remarks**

**SENIOR DESIGN PROJECT**

**PROJECT FINAL PRESENTATION (External)-Evaluation Sheet,**

**College of Engineering** **FALL-2019 (Spring-2016 Batch), BE MECHATRONICS ENGINEERING PROGRAM**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Project Title** |  |  | **Project advisor** |  |
| **Depart Ref No** | **KIET/ME/SDP/FALL-2019/001** |  | **Project coadvisor** |  |
| **Scheduled Date** |  | **Room Syndicate** |  | |

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| **Student Name** | **Student ID** | **Student Name** | **Student ID** |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Assessment** | **Max**  **Mar ks** | **SI**  **D:**  **809**  **4** | **SI D:**  **809**  **7** | **SI D:** | **Excellent 81-100%** | **Good 61-80%** | **Satisfactor y**  **41-60%** | **Poor**  **Below**  **40%** |
| CLO  1 | **Engineering**  **Knowledge**  The student has the ability to apply the knowledge of the math, science, and engineering specialization to the solution of complex engineering problems. | 12 |  |  |  | Strong concepts and in-depth  knowledge have been demonstrated. | Can provide sound  justification of their understanding | Have  scattered  knowledge, but can  develop  links with guided questions. | Can’t justify their  understandi  ng if questioned. |
| CLO  2 | **Problem**  **Analysis**  Principles of engineering are thoroughly applied to address the targeted complex  engineering  problem in  reaching  substantial  conclusion and are supported by the state-of-art research. | 14 |  |  |  | Thorough  application of engineering  principles is demonstrated reaching concrete conclusion supported by the state-of-art research. | Adequate engineering principles are applied to reach reasonable conclusion backed by authentic research. | Limited Analysis is done with too many assumptions  and weak  citations of prior stateof-the-art. | Inconclusive analysis  provided, mainly  utilizing hit and trial approach |

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| CLO  3 | **Design/Develop ment of Solution** Proposed design fulfills most of the requirements with some  recommended improvements and complies with existing standards of respective field and fulfills all requirements including safety, conservation and economics. | 8 |  |  |  | A systematic approach is used to  develop  solution  covering all  the aspects, which  complies with existing standards. | The solution covers most of the  requirements but does not fully comply with existing standard and need improvements. | The design is lacking some  necessary features  which are  required for the safety,  conservation and  economic concerns. | The design followed poor  engineering  approach that is  highly  deficient to  meet current standards. |
| CLO  4 | **Investigation**  The complex  engineering problem and its solutions were properly investigated in a methodical way. Valid conclusions have been derived after testing multiple case studies and conditions. | 2 |  |  |  | A broad and conclusive  investigation  of the problem and its  solutions is carried out  following a proper methodology | Most of the steps of methodical  investigation are  covered. However,  more case studies are needed to draw appropriate conclusion | There is need of  more  improvemen  ts in  experimentat ion and  testing  which may affect their conclusions. | Methodical investigatio n is not  followed with  conclusive findings. |
| CLO  5 | **Modern Tool**  **Usage**  The student utilized modern engineering tools, techniques and  available  resources to develop a mathematical  model of the engineering problem. | 6 |  |  |  | Most of the relevant modern  engineering  tools/techniqu es are utilized  to develop the proposed  mathematical model. | The selection of modern engineering  tool is appropriate.  However, its potentials have not been explored and applied fully. | Modern engineering  tool usage is trivial and necessary  familiarizati on is lacking. | Modern engineering tool  selection  and usage is  incorrect or entirely absent. |
| CLO  8 | **The Engineer and Society**  Student has explored and is well aware of possible social, economic and cultural effects (if any) of the  complex | 2 |  |  |  | Exploration of possible  social,  economic and  cultural effects  are carried out and clear  attempts are made to address them. | Social, economic and cultural effects are surveyed and only  suggestions are made to address them. | At least some social, economic  and cultural effects are  surveyed, but no  attempts are made to | Students are unaware of social,  economic  and cultural effects. |

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|  | engineering problem, and an attempt is made to address them in their designed solution. |  |  |  |  |  |  | address  them. |  |
| CLO  9 | **The Individual**  **and Team Work**  Student demonstrated his/her ability and work as an individual and/or in team to efficiently carry out tasks. | 2 |  |  |  | Student acknowledges and is well  aware of the  tasks carried out  individually and as team. | Adequate individual as well as team work is demonstrated in most of the tasks. | Individual work is  carried out  properly but lacks  support  provided to other  members of Team. | Demonstrate d very poor ability to  work in both individual and team. |
| CLO  10 | **Communication** Student was able to clearly explain his/her work contribution.  Effective use of charts, graphs, figures etc.  Dressed in highly professional manner. | 10 |  |  |  | The contribution was  demonstrated fluently and clearly with  effective use of charts,  graphs, figures etc. Dressed in highly  professional manner. | The contribution was demonstrated with  confident speech and fair use of charts,  graphs, figures etc. Generally, showed well-groomed and professional. | The contribution was  demonstrate d with  average  speech skills  and limited use of  charts,  graphs,  figures etc.  Dressed neatly but casual. | Monotone voice and  unstructured flow of  explanation shows poor  communicat ion skills.  Dressed inappropriat ely. |
| CLO  11 | **Project**  **Management**  Student exhibits management  skills through effective project planning, budget utilization, task scheduling and  meeting deadlines. | 2 |  |  |  | All the project tasks are managed  professionally  with optimal  planning, budget  utilization, task  breakdowns  and meeting  deadlines. | Demonstrated good management skills.  Most tasks are completed with  appropriate planning, budget and deadlines. | Most deadlines are  not met and many  changes are made in the project plan. | Project is poorly  managed.  Most tasks are  accomplishe d with  inefficient planning,  budget, and deadlines set. |
| CLO  12 | **Life Long**  **Learning**  The student  recognized his/her project as  Industry or  Academia funded project/Future commercializatio n  potential/Innovati | 2 |  |  |  | The solid evidence is  provided that project is  funded by any  industry/agenc y and has  potential for future  commercializa  tion / research use. | The project is funded by any industry/agency with limited future  commercialization/res earch use. | The project  is funded by any  industry/age  ncy with no future scope/goals. | The project is not  funded but has little  innovative future  research directions. |
|  | ve research aspect. |  |  |  |  |  |  |  |  |
|  | **Total marks** | **60** |  |  |  |  |  |  |  |

External Evaluator Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

External Evaluator Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Remarks**

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**SENIOR DESIGN PROJECT-II**

###### PROJECT FINAL PRESENTATION (PPT-2)-Project Evaluation Sheet, College of Engineering

**Fall-2019 (Spring-2016 Batch), BE MECHATRONICS ENGINEERING PROGRAM**

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| --- | --- | --- | --- | --- |
| **Project Title** |  |  | **Project advisor** |  |
| **Depart Ref No** | **KIET/ME/SDP/FALL-2019/001** |  | **Project coadvisor** |  |
| **Scheduled Date** |  | **Room Syndicate** |  | |

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| --- | --- | --- | --- |
| **Student Name** | **Student ID** | **Student Name** | **Student ID** |
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|  | **Assessment** | **Max**  **Mar ks** | **SI**  **D:**  **809**  **4** | **SI D:**  **809**  **7** | **SI D:** | **Excellent 81-100%** | **Good 61-80%** | **Satisfactor y**  **41-60%** | **Poor**  **Below**  **40%** |
| CLO  3 | **Design/Develop ment of Solution** Proposed design fulfills most of the requirements with some  recommended improvements and complies with existing standards of respective field and fulfills all requirements including safety, conservation and economics. | 5 |  |  |  | A systematic approach is used to  develop  solution  covering all  the aspects, which  complies with existing standards. | The solution covers most of the  requirements but does not fully comply with existing standard and need improvements. | The design is lacking some  necessary features  which are  required for the safety,  conservation and  economic concerns. | The design followed poor  engineering  approach that is  highly  deficient to  meet current standards. |
| CLO  4 | **Investigation**  The complex engineering problem and its solutions were properly investigated in a methodical way. Valid  conclusions have been derived after testing multiple | 6 |  |  |  | A broad and conclusive  investigation  of the problem and its  solutions is carried out  following a proper methodology | Most of the steps of methodical  investigation are  covered. However,  more case studies are needed to draw appropriate conclusion | There is need of  more  improvemen  ts in  experimentat ion and  testing  which may affect their conclusions. | Methodical investigation is not  followed with  conclusive findings. |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | case studies and conditions. |  |  |  |  |  |  |  |  |
| CLO  5 | **Modern Tool**  **Usage**  The student utilized modern engineering tools, techniques and  available  resources to develop a  mathematical  model of the  engineering problem. | 3 |  |  |  | Most of the relevant modern  engineering  tools/techniqu es are utilized  to develop the proposed  mathematical model. | The selection of modern engineering  tool is appropriate.  However, its potentials have not been explored and applied fully. | Modern engineering  tool usage is trivial and necessary  familiarizati on is lacking. | Modern engineering tool  selection  and usage is  incorrect or entirely absent. |
| CLO  7 | **Environment &**  **Sustainability**  Students should have an understanding of the societal and environmental impact of their engineering  project solutions and should be able to justify the sustainability of their designs. | 1 |  |  |  | Students have well explored the possible societal and  environmental impacts of  their solutions and have  demonstrated clearly the  sustainable development. | Students have adequate  understanding of societal and  environmental  impacts but are  unable to demonstrate the sustainable development. | At least students are  aware about  environment  al impacts and  sustainable  development of their  proposed solutions. | Students are unaware of  environment impacts and sustainable  development of their  proposed solutions. |
| CLO  9 | **The Individual**  **and Team Work**  Student demonstrated his/her ability and work as an individual and/or in team to efficiently carry out tasks. | 1 |  |  |  | Student acknowledges and is well  aware of the  tasks carried out  individually and as team. | Adequate individual as well as team work is demonstrated in most of the tasks. | Individual work is  carried out  properly but lacks  support  provided to other  members of Team. | Demonstrate d very poor ability to  work in both individual and team. |
| CLO  10 | **Communication** Student was able to clearly explain his/her work contribution. Effective use of charts, graphs, figures etc.  Dressed in highly professional manner. | 5 |  |  |  | The contribution was  demonstrated fluently and clearly with  effective use of charts,  graphs, figures etc. Dressed in highly  professional manner. | The contribution was demonstrated with  confident speech and fair use of charts,  graphs, figures etc. Generally, showed well-groomed and professional. | The contribution was  demonstrate d with  average  speech skills  and limited use of  charts,  graphs,  figures etc.  Dressed neatly but casual. | Monotone voice and  unstructured flow of  explanation shows poor  communicat ion skills.  Dressed inappropriat ely. |
| CLO  11 | **Project**  **Management** | 2 |  |  |  | All the project tasks are | Demonstrated good management skills. | Most deadlines are | Project is poorly |
|  | Student exhibits management skills through effective project planning, budget utilization, task scheduling and  meeting deadlines. |  |  |  |  | managed  professionally  with optimal  planning, budget  utilization, task  breakdowns  and meeting  deadlines. | Most tasks are completed with  appropriate planning, budget and deadlines. | not met and many  changes are made in the project plan. | managed.  Most tasks are  accomplishe d with  inefficient planning,  budget, and deadlines set. |
| CLO  12 | **Life Long**  **Learning**  The student  recognized his/her project as  Industry or  Academia funded project/Future commercializatio n potential/Innovat  ive research aspect. | 2 |  |  |  | The solid evidence is  provided that project is  funded by any  industry/agenc y or at least project is  innovative, and has  potential for future  commercializa  tion / research use. | The project is funded by any industry/agency or at least project is  innovative with  limited future  commercialization/res earch use. | The project  is funded by any  industry/age ncy or at  least project is minor  innovative  with no future scope/goals. | The project is neither  funded by any  industry/age ncy or at  least project is  innovative, nor has future scope/goals. |
|  | **Total marks** | **25** |  |  |  |  |  |  |  |

Evaluator’s Name : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Evaluator’sSignature:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Remarks**

**Senior Design Project-II –Report Evaluation Sheet**

**College of Engineering**

**Fall-2019 (Spring-2016 Batch), BE MECHATRONICS ENGINEERING PROGRAM**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Project Title** |  |  |  |  |
| **Depart Ref No** | **KIET/ME/SDP/FALL-2019/001** |  |  |  |
| **Scheduled Date** |  | **Room Syndicate** |  | |

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| --- | --- | --- | --- |
| **Student Name** | **Student ID** | **Student Name** | **Student ID** |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Assessment** | **Max**  **Mar ks** | **SI**  **D:** | **SI D:** | **SI D:** | **Excellent 80-100%** | **Good 60-80%** | **Satisfactor y**  **40-60%** | **Poor**  **Below**  **40%** |
| CLO  1 | **Engineering**  **Knowledge**  The student has the ability to apply the knowledge of the math, science, and engineering specialization to the solution of complex engineering problems. | 2 |  |  |  | Strong concepts and in-depth  knowledge have been demonstrated | Can provide sound  justification of their understanding | Have  scattered  knowledge , but can  develop  links with guided questions | Can’t justify their  understandi  ng if questioned. |
| CLO  2 | **Problem**  **Analysis**  Principles of engineering are thoroughly applied to address the targeted complex  engineering  problem in reaching  substantial  conclusion and are supported by the state-of-art research. | 2 |  |  |  | Thorough  application of engineering  principles is  demonstrated reaching concrete  conclusion  supported by  the state-of-art research. | Adequate engineering principles are applied to reach reasonable  conclusion backed by authentic research | Limited  Analysis is done with too many  assumptions and weak  citations of prior art. | Inconclusive analysis  provided, mainly  utilizing hit and trial approach |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CLO  3 | **Design/Develop ment of Solution** Proposed design fulfills most of the requirements with some  recommended improvements and complies with existing standards of respective field and fulfills all requirements including safety, conservation and economics. | 5 |  |  |  | A systematic approach is used to  develop  solution  covering all  the aspects, which  complies with existing standards. | The solution covers most of the  requirement but does  not fully comply with existing standard and need improvements. | The design is lacking some  necessary features  which are  required for the safety,  conservation and  economic concerns | The design followed poor  engineering  approach is highly  deficient to  meet current standards. |
| CLO  4 | **Investigation**  The complex  engineering problem and its solutions were properly investigated in a methodical way. Valid conclusions have been derived after testing multiple case studies and conditions. | 5 |  |  |  | A broad and conclusive  investigation  of the problem and its  solutions is carried out  following a proper methodology | Most of the steps of methodical  investigation are  covered. However  More case studies are needed to draw authentic conclusion | There is room for a lot of  improvemen  t in  experimentat ion and  testing  which may affect their conclusions. | Methodical investigatio n is not  followed with  inconclusive findings. |
| CLO  5 | **Modern Tool**  **Usage**  The student utilized modern engineering tools, techniques and  available  resources to develop a mathematical  model of the engineering problem. | 2 |  |  |  | Most relevant  IT tools are utilized with proper  understanding of their limitations. | Selection of IT tools is appropriate  however; its  potentials have not be explored and applied fully. | IT tool usage is  trivial with and  necessary  familiarizati on is lacking | Modern  Tools selection  and usage is  incorrect or entirely absent. |
| CLO  6 | **The Engineer and Society**  Student has explored and is well aware of possible social, economical and cultural effects (if any) of the  complex | 2 |  |  |  | Exploration of possible  social,  economical  and cultural  effects is  carried out and  clear attempts are made to address them. | Social, economical and cultural effects  are surveyed and only suggestions are made to address them. | At least some Social, economical  and cultural effects are  surveyed, but no  attempts are made to | Students are unaware of  Social, economical  and cultural effects. |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | engineering problem, and an attempt is made to address them in their designed solution. |  |  |  |  |  |  | address  them. |  |
| CLO  7 | **Environment &**  **Sustainability**  Students should have an understanding of the societal and environmental impact of their engineering  project solutions and should be able to justify the sustainability of their designs. | 1 |  |  |  | Students have well explored the possible societal and  environmental impacts of  their solutions and have  demonstrated clearly the  sustainable development. | Students have adequate  understanding of societal and  environmental  impacts but are  unable to demonstrate the sustainable development. | At least students are  aware about  environment  al impacts and  sustainable  development of their  proposed solutions. | Students are unaware of  environment impacts and sustainable  developmen t of their proposed solutions. |
| CLO  8 | **Ethics**  Apply ethical  principles,  commit to  professional  ethics and  responsibilities,  and norms of  engineering practice. | 10 |  |  |  | Students have well-applied ethical  principles and committed to professional ethics and  responsibilitie  s. | Students have adequately addressed ethical principles and tried to be committed to professional ethics and responsibilities. | Students are unable to survey  properly ethical  principles and  committed  to  professional ethics and  responsibiliti es. | Students are unaware of ethical  principles  and commit  to  professional ethics. |
| CLO  9 | **The Individual**  **and Team Work**  Student demonstrated his/her ability and work as an individual and/or in team to efficiently carry out tasks. | 3 |  |  |  | Each member acknowledges and is well  aware of the  tasks carried out  individually and as team. | Good individual and well as team work is  demonstrated in most of the task. | Individual work is  carried out  properly but lacks  support  provided to other  member of Team. | No support in effort of others is shown. |
| CLO  10 | **Communication** Student was able to clearly explain his/her work contribution. Effective use of charts, graphs, figures etc.  Dressed in highly professional manner. | 3 |  |  |  | Use of very fluent speech.  Effective use of charts,  graphs, figures etc. Dressed in highly  professional manner. | Confident speech.  Fair use of charts, graphs, figures etc.  Generally well groomed and professional. | Limited use of charts, graphs,  figures etc.  Dressed neatly but casual. | Monotone voice.  Information  in  unstructured way.  Dressed inappropriat ely. |
| CLO  11 | **Project**  **Management**  Student exhibits management skills through effective project planning, budget utilization, task scheduling and  meeting deadlines. | 3 |  |  |  | Project has a proper  breakdown in  tasks. With optimal  utilization of budget. | Most Tasks are completed as planned and Proper utilization of budget is demonstrated. | Most deadlines are  not meet and many  changes are made in  Project plan. | Project is poorly  managed  and budget is utilized inefficiently. |
| CLO  12 | **Life Long**  **Learning**  The student  recognized his/her project as  Industry or  Academia funded project/Future commercializatio n potential/Innovati  ve research aspect. | 2 |  |  |  | The solid evidence is  provided that project is  funded by any  industry/agenc y and has  potential for future  commercializa  tion / research use. | The project is funded by any industry/agency with limited future  commercialization/res earch use. | The project  is funded by any  industry/age  ncy with no future scope/goals. | The project is not  funded but has little  innovative future  research directions. |
|  | **Total marks** | **40** |  |  |  |  |  |  |  |

Report Evaluator’s Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Report Evaluator’s Signature with Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

###### Remarks

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**Note:**

Q1: The project report should clearly state the project statement, and should also justify the project relevance to the related discipline

using literature which could be understood by individuals from a non-engineering background. (CLO-1) Q2: A well defined implementation approach, backed by some relevant references (CLO-2).

Q3: Report should clearly present the experimentation details, simulation setup, and statistical analysis employed to investigate the proposed solution. (CLO-3/4)

Q4: Discussion of IT tools utilized during design and testing phases of the project, along with a discussion of optimizations made possible by their employment. (CLO-5)

Q5: A discussion of the social, cultural, legal, and safety issues related to the project and also detail some the possible solution for these issues. (CLO-6)

Q6: A discussion of the potential environmental and health hazards of the project, along with a sustainable approach to complete the design. (CLO-7)

Q7: All the contents presented in the report should be original, along with proper referencing for the material used such as: pictures, graphs etc. (CLO-1)

Q8: Project report is clear, detailed and easy to read. Also, the project report should be complete and covers all relevant topics. (CLO-

10)

Q9: The report should include a Gantt chart which clearly states the project milestones and their respective deadlines. (CLO-11)

Q10: A section should be dedicated to the future enhancements possible in the design. (CLO-12)

# ANNEXURE-H (Students Admissions and Enrolments)

**Students Admissions and Enrolments**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **S**  **No** | **Intake Batch** | **Total Applicants** | **Total**  **Admissons**  **Offered \*** | **Total**  **Students**  **Admitted** | **Present Strength** | **No. of Sections** |
| 1 | Spr 2017 | 100 | 54 | 25 | 14 | 01 |
| 2 | Spr 2018 | 147 | 90 | 37 | 29 | 01 |
| 3 | Spr 2019 | 184 | 51 | 23 | 19 | 01 |
| 4 | Spr 2020 | 116 | 42 | 18 | 18 | 01 |
| 5 | Spr 2021 | 164 |  | 33 | 21 | 01 |

\* Total Admissions offered in all merit lists

# ANNEXURE-I (Faculty Strength)

**Faculty Strength Annexure-I**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **List of Full-Time Departmental Teaching Faculty, sorted by Designation** | | | | | | | | | | | | | | |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Sr. No.** | **Name** | **PEC #** | **Designation** | **Joining Date** | **Details of Qualifications** | | | **Specialization** | **Experience Teaching (Total) Years** | **Dedicated / Shared** | **Cr. Hrs. taught in the Current & Last Semesters** | | | |
| **MS** | | **BS** | |
| **Degree** | **Year** | **Institution** | **SP-21** | **FA - 21** | **SP-21** | **FA -21** |
| 1 | Dr. Muhammad Bilal Kadri | COMP/02985 | Professor &  **Head of Department (Mechatronics)** | 01/10/14 | Ph.D. | 2009 | **University of Oxford, UK** | Engg. Science | 17.5 years | Dedicated | 3+0 | 3+0 | 3+0 | 3+0 |
| BS | 2002 | **GIK Institute of Engineering Science & Technology, Pakistan** | Computer System Engineering |
| 2 | Dr. Muzaffar Mahmood | MECH-9461 | Professor | 13/01/14 | Ph.D. | 1980 | **(AE) Cranfield Institute of Technology, UK** | Applied Energy | 39 years | Dedicated | - | - | 3+0 3+0 | 3+0 2+0 |
| M.Sc | 1977 | **(AE) Cranfield Institute of Technology, UK** | Applied Energy |
| BE | 1973 | **NED University, Pakistan** | Mechanical |
| 3 | Muhammad Ahsan Nawaz | MECH/36975 | Lecturer | 15/09/2021 | MSc | 2020 | **Kyungpook National University, South Korea** | Mechanical Engg. | 3 years | Dedicated | - | - | 3+0 3+0 | 3+1  0+1 |
| BSc | 2017 | **University of Engineering and Technology, Lahore** | Mechanical Engg |
| 4 | Mohammad Saad Salim | MECH/34671 | Lecturer | 11/01/2021 | MSc | 2019 | **Kyungpook National University, South Korea** | Mechanical | 4 years | Dedicated | - | - | 3+0 3+0 3+0  0+1 | 3+0  3+0  0+2 |
| BSc | 2015 | **GIK Institute of Engineering Science & Technology, Pakistan** | Mechanical |
| 5 | Misbah-Ul-Haque | ELECTRO/24409 | Lecturer | 15/09/19 | MS | 2018 | **MAJU** | Electrical Engineering | 6.0 years | Dedicated | - | - | - | 3+0  3+0  0+1  0+1 |
| BE | 2016 | **KIET** | Electronics Engineering |
| 6 | Muhammad Duraid | Indus/1908 | Lecturer | 10/01/17 | MS | 2016 | **NED University, Pakistan** | Mechanical Engg (Design) | 1.5 years | Dedicated | - | - | 0+1 0+1 0+1 0+2 | 0+1 0+1 0+1 0+1 0+1 |
| BE | 2011 | **NED University, Pakistan** | Industrial and Manufacturing Engg |
| 7 | Sofia Yousuf Sheikh | Electro/18842 | Lecturer | 22/08/17 | ME | 2018 | **PAF-KIET, Pakistan** | Electronics | 5 years | Dedicated | - | - | 2+0  3+0  3+0 | 3+0 3+0 |
| BE | 2012 | **NED University, Pakistan** | Electronics |
| 8 | Bushra | ELECTRO/239  15 | Lab Engineer | 29/08/1 6 | ME | 2019 | **NED**  **University**  **y,**  **Pakistan** | Electronics | 5 years | Dedicate d | - | - | 2+0  3+0  3+0 | 3+0  3+0  0+1 |
| BE | 201  6 | **Mehran-**  **UET,**  **Pakistan** | Electronics |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **List of Shared/Visiting Faculty from other Departments/Organizations, sorted by Designation,** | | | | | | | | | | | | |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Sr. No.** | **Name** | **PEC #** | **Designation** | **Joining Date** | **Details of Qualifications** | | | **Specialization** | **Experience Teaching (Total) Years** | **Dedicated / Shared** | **Cr. Hrs. taught in the Current & Last Semesters** | |
| **Degree** | **Year** | **Institution** | **MS** | **BS (Last)** |
| **Faculty of College of Humanities Science** | | | | | | | | | | | | |
| 1 | Dr. Muhammad Amin |  | Professor & Director of CoH&S | 09-01-02 | PhD | 1963 | **Imperial College, London** | Applications of Mathematics | 60 years | Dedicated |  | 06 + 06 |
| DIC | 1951 | **Imperial College, London** |
| M.SC | 1960 | **Punjab University** |
| 2 | Mr. M.Shahbaz Khan |  | Assistant Professor | 09-04-01 | MS | 2016 | **Institute of Business Management, Pakistan** | Statistics & Scientific Computing | 15 years | Dedicated |  | 09 + 12 |
| M.SC | 2000 | **Karachi University, Pakistan** | Statistics |
| B.Sc (Hons) | 1999 | **Karachi University, Pakistan** | Science |
| 3 | Mr.Ahmed Faraz Ayubi |  | Assistant Professor | 01-11-14 | MS | 2014 | **NEDUET, Pakistan** | Applied Mathematics | 10 years | Dedicated |  | 12 + 15 |
| M.SC | 2005 | **Karachi University, Pakistan** | Mathematics |
| B.Sc (Hons) | 2004 | **Karachi University, Pakistan** | Science |
| 4 | Mr.Muhammad Imran |  | Assistant Professor | 01-09-18 | MS | 2015 | **Bacha Khan University, Pakistan** | Mathematics | 09 years | Dedicated |  | 12 + 0 |
| M.Sc | 2006 | **Gomal University , Pakistan** | Mathematics |
| B.Sc | 2004 | **Islamia College Peshawar, Pakistan** | Science |
| 5 | Ms.Ammarah Nazakat |  | Lecturer | 16/01/2016 | MS | 2014 | **NEDUET, Pakistan** | Applied Mathematics | 06 years | Dedicated |  | 00 + 12 |
| M.SC | 2012 | **Karachi University, Pakistan** | Mathematics |
| B.Sc (Hons) | 2011 | **Karachi University, Pakistan** | Science |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Faculty of Department of English** | | | | | | | | | | | | | |
| 6 | Muhammad Ajmal Khan |  | Assistant Professor | 07-Sep-04 | M.Phil (Thesis submitted) | Jun-18 | **Iqra University, Pakistan** | Education | 16 yrs | Shared | - | 06 + 06 |
| MA | 2003 | **Karachi University, Pakistan** | English (Linguistics) |
| MA | 2002 | **Karachi University, Pakistan** | English (Literature) |
| 7 | Tariq Aziz |  | Assistant Professor | 05-Sep-11 | MS | 2016 | **NEDUET Karachi, Pakistan** | English (Linguistics) | 7.5 yrs | Shared | - | 09 + 02 |
| MA | 2010 | **Karachi University, Pakistan** | English (Linguistics) |
| 8 | Air Cdre (Retd) Khayyam Durrani |  | Associate  Professor | 14-Jan-13 | MA | 1968 | **Sind University, Pakistan** | English | 49 yrs. | Shared | - | 00 + 03 |
| 9 | Malik Rehmat Ullah |  | Lecturer | 22-Aug-17 | M.Phil (Erolled) | - | **Iqra University, Pakistan** | English | 1 yr. | Shared | - | 03 + 00 |
| MA | 2017 | **NUML Karachi Campus, Pakistan** | English (Ling. & Lit.) |
| 10 | Farhan Uddin Raja |  | Lecturer | 27-Aug-10 | PhD (Enrolled) | - | **Sind University, Pakistan** | English (Linguistics) | 7.5 yrs | Shared | - | 00 + 02 |
| MS | 2017 | **Karachi University, Pakistan** | English  (Linguistics) |
| MA | 2010 | **Karachi University, Pakistan** | English (Linguistics) |
| 11 | Abdul Qadir |  | Lecturer | 15-Jan-18 | M.Phil (Enrolled) | - | **Karachi University, Pakistan** | Islamic Studies | 13.5 yrs | Shared | - | 00 + 06 |
| MA | 2006 | **Karachi University, Pakistan** | Arabic |
| MA | 2003 | **Karachi University, Pakistan** | Islamic Studies |
| 12 | Muhammad Sadiq |  | Lecturer | 18-Jan-16 | MA | 1968 | **Punjab University Lahore, Pakistan** | Political Science | 12 yrs. | Shared | - | 06 + 00 |
| MA | 1970 | **Punjab University Lahore, Pakistan** | English |
| 13 | Sohaib Ahmed Siddiqui |  | Lecturer | 27-Aug-12 | MA | 2012 | **Karachi University, Pakistan** | English  (Literature) | 11.5 yrs. | Shared | - | 03 + 00 |
| MA | 2007 | **Karachi University, Pakistan** | Islamic Studies |

**List of Full-Time Lab. Engineers/Teaching Assistants**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Sr. No.** | **Name** | **PEC #** | **Designation** | **Joining Date** | **Details of Qualifications** | | **Institution** | **Specialization** | **Experience Teaching (Total) Years** | **Dedicated / Shared** | **Cr. Hrs. taught in the Current & Last Semesters** | | | |
| **MS** | | **BS** | |
| **Degree** | **Year** | **FA-18** | **SP-18** | **SP-21** | **FA-21** |
| 1 | Hamza Hamid Taimuri | MECHATRO/03052 | Lab Engineer | 23-Jan-2018 | MS-CSIT | In Progress | **NED-UET** | Computer Science & Information Technology | 4 Years |  |  |  | 0+1  0+1  0+1 | 0+1  0+1 |
| BE-Mechatronics | 2017 | **KIET** | Mechatronics |
| 2 | Muhammad Tehreem | ELECTRO/26878 | Lab Engineer | 19-June-2019 | MS-Electronics | In Progress | **KIET** | Electronics | 2 Years |  |  |  | 0+1  0+1  0+1  0+1 | 0+1  0+1  0+1 |
| BE-Electronics | 2015 | **KIET** | Electronics |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|
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|

# ANNEXURE-J (Faculty Summary)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | **Faculty Summary** | | | | |  |  |  |  |  | Annexure-J |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Present Scenario** |  |  |  |  |  |  |  |  |  | **Number of New Faculty members inducted** | | | |
|  |  |  |  |  |  |  |  |  |  | **in the program since last PEC Visit** | | | |
|  | **Faculty teaching Engineering Subjects** | | | | **Faculty teaching Non-Engineering Subjects** | | | |  | **BSc** | 0 |  |  |
|  | **MSc** | 0 |  |  |
| **BSc** | **MSc** | **PhD** | **Total** | **BSc** | **MSc** | **PhD** | **Total** |  | **PhD** |  |  |  |
| **Program Faculty (Dedicated)** | 2 | 5 | 2 | **9** | 0 | 0 | 0 | 0 |  |  |  |  |  |
| **Program Faculty (shared with other programs)** | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 |  |  | | | |
| **Shared Faculty (from other programs)** | 4 | 3 | 0 | 7 | 0 | 5 | 0 | 5 |  |  | | | |
| **Visiting Engg Faculty** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **TA/RA** |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Scenario at the time of Last PEC Visit** |  |  |  |  |  |  |  |  |  | **Number of Faculty members who left** | | | |
|  |  |  |  |  |  |  |  |  |  | **the program since last PEC Visit.** | | | |
|  | **Faculty teaching Engineering Subjects** | | | | **Faculty teaching Non-Engineering Subjects** | | | |  | **BSc** | 1 |  |  |
|  | **MSc** | 1 |  |  |
| **BSc** | **MSc** | **PhD** | **Total** | **BSc** | **MSc** | **PhD** | **Total** |  | **PhD** |  |  |  |
| **Program Faculty (Dedicated)** | 2 | 5 | 2 | 9 | 0 | 0 | 0 | 0 |  |  |  |  |  |
| **Program Faculty (shared with other programs)** | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 |  |  | | | |
| **Shared Faculty (from other programs)** | 4 | 5 | 0 | 9 | 0 | 5 | 0 | 5 |  |  |  |  |  |
| **Visiting Engg Faculty** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **TA/RA** |  |  |  |  |  |  |  |  |  |  |  |  |  |

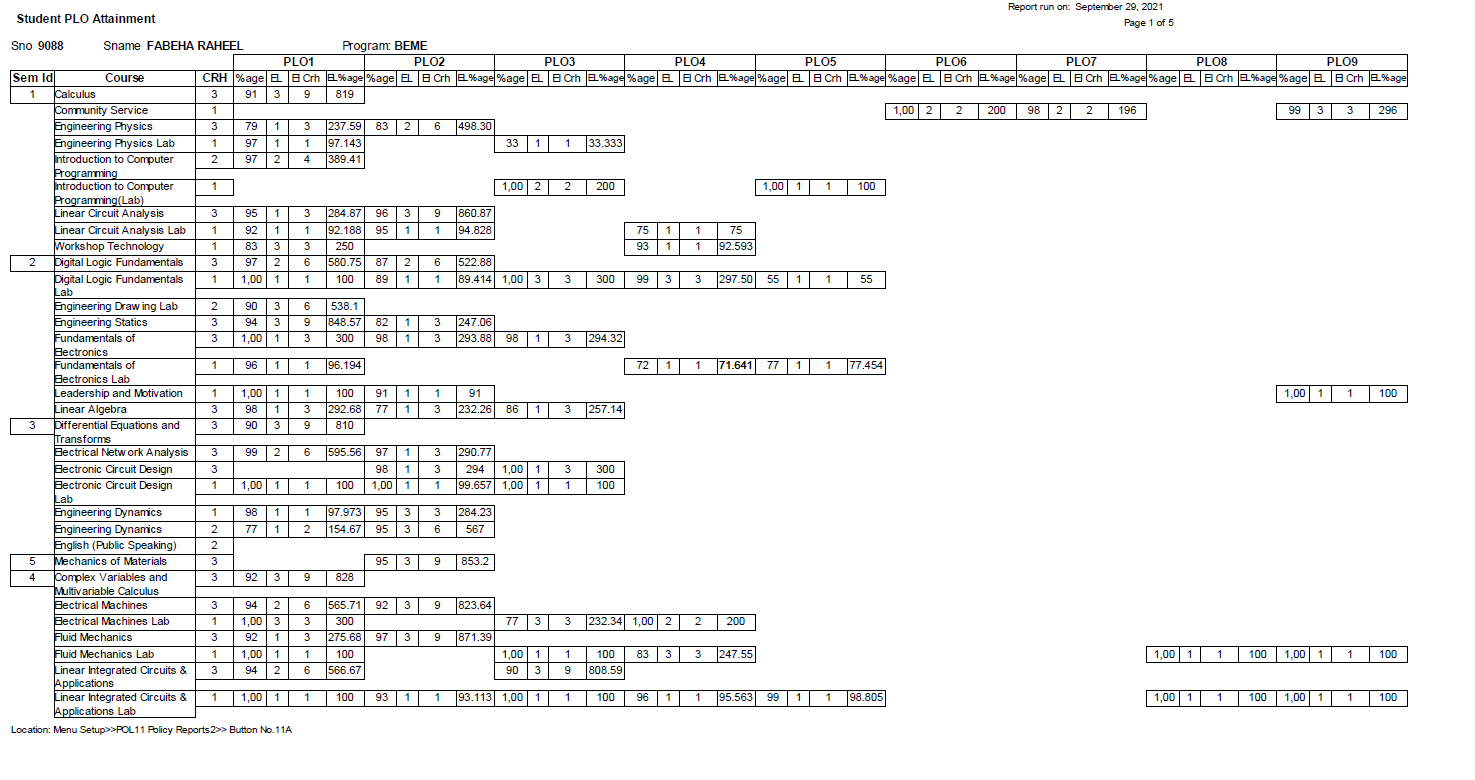
# ANNEXURE-K (Faculty Loading)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Department Of Mechatronics Faculty Course Load Fall-2021** | | | | | | |
|
| **S.NO** | **Faculty Member Name** | **Course Name** | **Credit Hour** | **Contact Hours** | **Total Creidt Hours** | **Total Contact Hours** |
| 1 | Dr. Muzzaffar Mahmood (Professor) | Technology Entrepreneurship | 3 | 3 | 9 | 9 |
| Engineering Project Management | 3 | 3 |
| Dean (Academics) | 3 | 3 |
|  |  |  |  |  |  |  |
| 2 | Dr. Muhammad Bilal Kadri (Professor) | Mobile Robotics | 3 | 3 | 12 | 12 |
| GSSE Course | 3 | 3 |
| Research | 3 | 3 |
| HOD Mechatronincs | 3 | 3 |
|  |  |  |  |  |  |  |
| 3 | Lecturer Misbah-ul-Haq | Power Electronics Lab( Sec-A) | 1 | 3 | 8 | 12 |
| Power Electronics Lab( Sec-B) | 1 | 3 |
| Digital Logic Fundamentals | 3 | 3 |
| Power Electronics | 3 | 3 |
|  |  |  |  |  |  |  |
| ~~4~~ | Lecturer Saad | Materials and Manufacturing Processes | 3 | 3 | 8 | 12 |
| Engineering Mechanics | 3 | 3 |
| Engineering Drawing | 2 | 6 |
|  |  |  |  |  |  |  |
| 5 | Lecturer Duraid | Engineering Statics | 3 | 3 | 12 | 12 |
| Machine Design | 3 | 3 |
| SDP Coordinator | 3 | 3 |
| Departmental OBE Coordinator | 3 | 3 |
|  |  |  |  |  |  |  |
| 6 | Lecturer Sofia | Fundamental of Electronics | 3 | 3 | 12 | 12 |
| Sensors and Actuators (Repeaters) | 3 | 3 |
| BoS Secretary | 3 | 3 |
| PhD student (Research Project with Dr. Bilal) | 3 | 3 |
|  |  |  |  |  |  |  |
| 7 | Lecturer Bushra | Sensors and Actuators Lab (Repeaters) | 1 | 3 | 10 | 12 |
| Electrical Machines | 3 | 3 |
| LICA | 3 | 3 |
| Technical Events Coordinator | 3 | 3 |
|  |  |  |  |  |  |  |
| 8 | Lecturer M Ahsan Nawaz | Engineering Workshop | 1 | 1 | 6 | 10 |
| Fluid Mechanics Lab (Sec-A) | 1 | 3 |
| Fluid Mechanics Lab (Sec-B) | 1 | 3 |
| Fluid Mechanics | 3 | 3 |
|  |  |  |  |  |  |  |
| 9 | Lab Engr. Tehreem | DLF Lab (Sec-A) | 1 | 3 | 5 | 15 |
| DLF Lab (Sec-B) | 1 | 3 |
| Electrical Machines (Sec-A) | 1 | 3 |
| Electrical Machines (Sec-B) | 1 | 3 |
| DSP Lab | 1 | 3 |
|  |  |  |  |  |  |  |
| 10 | Lab.Engr Hamza Hamid | FE Lab (Sec-A) | 1 | 3 | 7 | 15 |
| FE Lab (Sec-B) | 1 | 3 |
| LICA (Sec-A) | 1 | 3 |
| LICA (Sec-B) | 1 | 3 |
| GSSE Student and Research project member with Dr. Bilal | 3 | 3 |

# ANNEXURE-L (Departmental Budget)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **University Income Details** | | | | | | |
|  |  |  |  |  |  |  |
| **S #** | **Source of Income** | **Current Fiscal Year** | **1st Prev Fiscal Year 2020-21** | | **2nd Prev Fiscal Year 2019-20** | |
| **Budgeted** | **Actual (As per Audit Report)** | **Budgeted** | **Actual (As per Audit Report)** |
| 1 | Grants from HEC | 2021-2022 | - | - | - | - |
| 2 | Self Finance Schemes | 2021-2022 | - | - | - | - |
| 3 | Tuition Fee | 2021-2022 | 11,415,622 | 15,246,197 | 13,682,662 | 17,629,696 |
| 4 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| **Univeristy Expenditure Details** | | | | | | |
|  |  |  |  |  |  |  |
| **S #** | **Expenditure Head** | **Current Fiscal Year** | **1st Prev Fiscal Year 2020-21** | | **2nd Prev Fiscal Year 2019-20** | |
| **Budgeted** | **Actual (As per Audit Report)** | **Budgeted** | **Actual (As per Audit Report)** |
| 1 | Faculty and Supporting Staff Salaries | 2021-2022 | 7,811,703 | 10,014,010 | 9,197,727 | 10,570,897 |
| 2 | Maintenance of Existing Facilities | 2021-2022 | 147,471 | 187,681 | 158,167 | 261,142 |
| 3 |  |  |  |  |  |  |
| 4 |  |  |  |  |  |  |

# ANNEXURE-M (Sample CLO/PLO Attainment Reports)



Graphical user interface, text, application

Description automatically generated

Timeline

Description automatically generated

A picture containing graphical user interface

Description automatically generated

Table

Description automatically generated with low confidence

Table

Description automatically generated

Chart, table

Description automatically generated

A picture containing graphical user interface

Description automatically generated

Timeline

Description automatically generated

Timeline

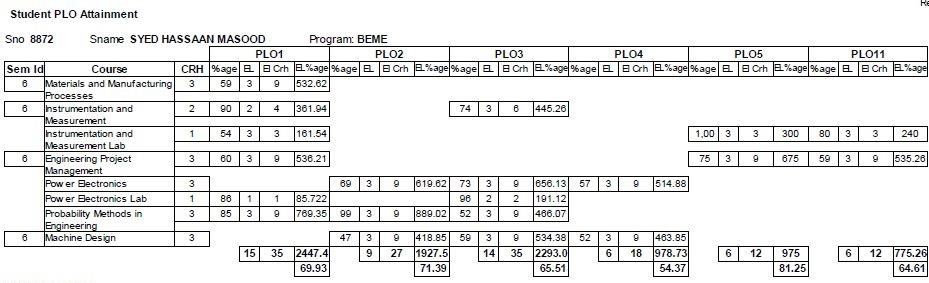
Description automatically generated with medium confidence

A picture containing timeline

Description automatically generated

A picture containing table

Description automatically generated



**Semester #**



**Courses**



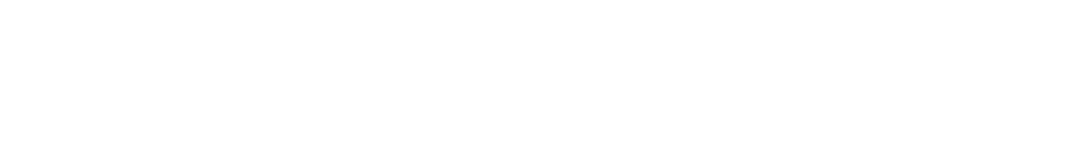
**Credit**



**Program**

Bachelors in Mechatronics

=



%age

-

Percentage of Marks in that PLO

EL

-

Emphasis Level of

that PLO

EL Crh

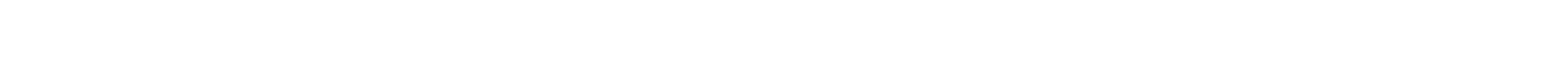
-

Product of EL(Emphasis Level) and Crh(Credit Hour) of that PLO

EL %age

-

Product of EL Crh(Emphasis Level Credit Hour) and %age of that



**The Top Value (2447.4 in this case) =**

sum of EL %age (Emphasis level percentage) of all the subje

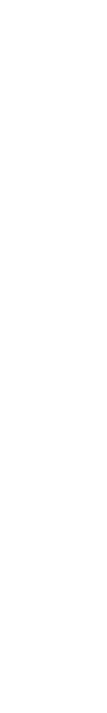
cts of the PLO

**The Bottom Value (69.93 in this case) =**

The Top Value (2447.4) divided by the sum of EL Crh of that PLO (18)



**Sum of EL Crh**



**PLO Attainment**

# ANNEXURE-N (Details of Faculty Research Work)

**Details of Faculty Research Work**

Publications

**Dr. Muhammad Bilal Kadri**

**Books/ Book Chapter(s)**

1. Kadri, M.B., “Disturbance Rejection using Neuro-Fuzzy Controllers”, 2008, Publisher:

VDM-Verlag, ISBN: 978-3-639-21041-

1. Kadri, M.B., “Model Free Adaptive Fuzzy Control”, 2008, Publisher: VDM-Verlag, ISBN: 978-3-639-21676-9

1. Kadri, M.B., Hassan, M.U., Amin, I. “Proficiency of Fuzzy Logic Controller for

Stabilization of Rotary Inverted Pendulum based on LQR Mapping”, Fuzzy Logic and Applications, Lecture Notes in Computer Science Volume 8256, 2013, pp 201-211.

**Conference Papers**

1. Kadri, M.B., Dexter, A.L., “Disturbance rejection in information-poor systems using an adaptive model-free fuzzy controller”, The 28th North American Fuzzy Information Processing Society Annual Conference, 14th -17th June,2009, Page(s) 1-6, Ohio, USA.

1. Kadri, M.B., “Disturbance Rejection in model free adaptive control using feedback”, The

29th IASTED International Conference on Modeling Identification and Control (MIC 2010), 15th 17th February, 2010, Innsbruck, Austria

1. Kadri, M.B., Hussain, S., “Model Free Adaptive Control based on FRM with an approach to reduce the control activity”, 2010 IEEE International Conference on Systems, Man and Cybernetics (SMC 2010), 10th -13th October, 2010, Istanbul, Turkey.

1. Kadri, M.B., “Robust Model Free Fuzzy Adaptive Controller with Fuzzy and Crisp

Feedback error learning schemes ”, 12th International Conference on Control, Automation and Systems (ICCAS 2012), 17th -21st October, 2012, Jeju Island, Korea.

1. Kadri, M.B., Raees, A., “Fuzzy Model Based Predictive Control of a Hammerstein Model with Constraint Handling” ,The first International IEEE-AESS Conference in Europe about Space and Satellite Telecommunications, 2nd -5th October 2012, Rome, Italy.

1. Kadri, M.B., Muneer, A., “Pitch Angle Control of DFIG using Self Tuning Neuro Fuzzy

Controller”, in International Conference on Renewable Energy Research and Applications (ICRERA), 20th-23rd October 2013, Madrid, Spain.

1. Khan, A.U. Kadri, M.B., “MPC of Hammerstein Model with Evolving Fuzzy”, IEEE International Conference on Emerging Technologies (ICET 2012), 8th -9th October, 2012, Islamabad, Pakistan.

1. Raees, A., Kadri, M.B., “Fuzzy Hammerstein model based Generalized Predictive Control for Ball and Beam System”, The 8th IEEE International Conference on Emerging Technologies (ICET 2012), 8th -9th October, 2012, Islamabad, Pakistan.

1. Khalid, M.U., Kadri,M.B., “Liquid Level Control of Nonlinear Coupled Tanks System using

Linear Model Predictive Control”, The 8th IEEE International Conference on Emerging Technologies (ICET 2012), 8th -9th October, 2012, Islamabad, Pakistan.

1. Hussain, .A.S., Kadri, M.B., “Control of under-actuated two-link robot with linear quadratic regulator and fuzzy controller”, The 2012 15th International Multitopic Conference (INMIC 2012), 13th -15th December 2012, Islamabad, Pakistan.

1. Khan, S., Kadri, M.B., “Fuzzy Adaptive Pitch Controller of a Wind Turbine”, The 2012 15th International Multitopic Conference (INMIC 2012), 13th -15th December 2012, Islamabad, Pakistan.

1. Aftab, S., Kadri, M.B., “Parameter Identification of Takagi-Sugeno Fuzzy Model of Surge

Tank System”, in 3rd IEEE International Conference on Computer, Control and Communication (IC4 2013), 25th -26th September 2013, Karachi, Pakistan

1. Aftab, S., Kadri, M.B., “Design of Fuzzy Logic Based Level Controller for Surge Tank

System”, in 3rd IEEE International Conference on Computer, Control and Communication (IC4 2013), 25th -26th September 2013, Karachi, Pakistan

1. Khan, H.S., Kadri, M.B., “DC Motor Speed Control by Embedded PI Controller with Hardware-in-loop Simulation”, in 3rd IEEE International Conference on Computer, Control and Communication (IC4 2013), 25th -26th September 2013, Karachi, Pakistan

1. Hussain, S.A., Kadri, M.B., “Control of Under-Actuated Two-Link ROBOT with Hybrid

LQ-Fuzzy Controller” in International Conference on Robotics & Emerging Allied Technologies in Engineering (iCREATE), 22nd-24th April 2014, Islamabad, Pakistan.

1. Khan, H.S., Kadri, M.B., “Fuzzy Scheduled Gain Middleware for Networked Control Systems” in International Conference on Robotics & Emerging Allied Technologies in Engineering (iCREATE), 22nd-24th April 2014, Islamabad, Pakistan.

1. Alam, I.J., Kadri, M.B.,” Detecting Edges in an Image with the Help of Fuzzy Parameters” in 11th International Conference on Frontiers of Information Technology (FIT 2013), 16th -18th December 2013, Islamabad, Pakistan.

1. Faisal, M., Kadri, M.B.,” Fuzzy PI-controller with self tuning scaling factors”,9th International Conference on Emerging Technologies 2013 (ICET 2013), 9th -10th December 2013, Islamabad, Pakistan.

1. Rizvi, A., Kadri, M.B., “Online Adaptation of Rotor Parameters Using Fuzzy Logic in

Indirect Field Oriented Vector Control of AC Induction Drives”, 9th International Conference on Emerging Technologies 2013 (ICET 2013), 9th -10th December 2013, Islamabad, Pakistan.

1. Rizvi, A., Kadri, M.B., “Sensor-less Temperature Estimation for Thermal Protection of

Vector Controlled AC Drives Using Fuzzy MRAS” in International Conference on Modeling & Simulation (ICOMS 2013), 25th – 27th November 2013, Islamabad, Pakistan.

1. Hussain, S.A., Kadri, M.B., “Close Loop Performance Analysis of Under-Actuated Two-

Link Robot over Networked Control System” in International Conference on Robotics & Emerging Allied Technologies in Engineering (iCREATE), 22nd-24th April 2014, Islamabad, Pakistan.

1. Arif, M.U., Iqbal, D.K., Kadri, M.B. "Adaptive Online Fuzzy Controller For A Coupled Tank System", The 2014 17th International Multitopic Conference (INMIC 2014), 8th -10th December 2014, Karachi, Pakistan.

1. Khan, H.S., Kadri, M.B. "Position Control of Quadrotor by Embedded PID Control with Hardware in Loop Simulation", The 2014 17th International Multitopic Conference (INMIC 2014), 8th -10th December 2014, Karachi, Pakistan.

1. Faisal, M, Kadri, M.B. "Fuzzy Adaptive PI Smith Control for Time Delay Systems", The 2014 17th International Multitopic Conference (INMIC 2014), 8th -10th December 2014, Karachi, Pakistan.

1. Rajput, M.A., Kadri, M.B. "Dynamic Fuzzy Modelling of Cooling Coil System", The 2014 17th International Multitopic Conference (INMIC 2014), 8th -10th December 2014, Karachi, Pakistan.

1. Khalid, M.A., Kadri, M.B. "Dynamic System Modeling of Industrial Boiler", The 2014 17th International Multitopic Conference (INMIC 2014), 8th -10th December 2014, Karachi, Pakistan.
2. Sardar, S., Kadri, M.B., “Autonomous Control of a Quadcopter via Fuzzy Gain Scheduled

PD Control”, The 12th International Conference on Frontiers of Information Technology (FIT 2014), 17th -19th December 2014, Islamabad, Pakistan.

1. Khan, H.S, Kadri, M.B., "Attitude and Altitude Control of Quadrotor by Discrete PID control and Non-linear Model Predictive Control", The 6th International Conference on Information and Communication Technologies (ICICT 2015), 12th -13th December 2015, Karachi, Pakistan.
2. Khan, H.S, Kadri, M.B.,” Liquid Level Control of Coupled Tanks System Using Fuzzy Model Predictive Control” in 13th International Conference on Frontiers of Information Technology (FIT 2015), 14th -16th December 2015, Islamabad, Pakistan.

1. Tanveer, F., Kadri, M.B., Jumani, N., Pirwani,N., "Fuzzy based tuning of a Sensor Fusion based Low Cost Attitude Estimator", The 6th International Conference on Innovative Computing Technology (INTECH 2016), 19th -21st September 2016, Islamabad, Pakistan.

1. Sami,A., Kadri, M.B., Jumani, N., Pirwani,N., "Design & simulation of fuzzy PID for hydro power plant Speed Control Using Fuzzy PID", The 6th International Conference on Innovative Computing Technology (INTECH 2016), 19th -21st September 2016, Islamabad, Pakistan.

1. Raees,A. , Kadri, M.B., Jumani, N., Pirwani,N., "Inverse Fuzzy Modeling for the

Cancellation of Nonlinearity in Unknown Hammerstein Model" , The 6th International Conference on Innovative Computing Technology (INTECH 2016), 19th -21st September 2016, Islamabad, Pakistan.

1. Sofia Yousuf, Muhammad Bilal Kadri "Sensor Fusion of INS, Odometer and GPS for Robot Localization", 2016 IEEE Conference on Systems, Process and Control (ICSPC 2016), 16-18 December 2016 Melaka, Malaysia.

1. Sofia Yousuf, Muhammad Bilal Kadri "Comparison of two different model free fuzzy control architectures based on inverse plant modeling", International Conference On Latest trends in Electrical Engineering & Computing Technologies, 15 - 16 November 2017, Karachi, Pakistan.

1. Tanveer. F, Kadri, M.B., "A simulation framework for decentralized formation control of nonholonomic differential drive robots", 2018 SICE International Symposium on Control Systems (SICE ISCS), 9-11 March 2018, Tokyo, Japan.

**Journal Publications**

1. W. A. Khan, M. B. Kadri and Q. Ali, "Optimization of Micro-channel Heat Sinks Using Genetic

Algorithm," Heat Transfer Engineering, vol. 34, pp. 279-287, 2013. (Impact Factor 1.216)

1. M. B. Kadri, "Control Structures for Multiplicative Input Disturbance Rejection using Adaptive

Direct Fuzzy Controllers," Arabian Journal for Science and Engineering, Vol 38 (6), pp 1427-1435, 2013. (Impact Factor 1.092)

1. M. B. Kadri, "System Identification of a Cooling Coil Using Recurrent Neural Networks,"

Arabian Journal for Science and Engineering, Vol. 37, pp. 2193-2203, 2012. (Impact Factor 1.092)

1. M. B. Kadri, "Disturbance Rejection in Nonlinear Uncertain Systems Using Feedforward

Control," Arabian Journal for Science and Engineering, Vol 38 (9), pp 2439-2450. 2013. (Impact Factor 1.092)

1. M. B. Kadri, "Comparison of fuzzy identification schemes for robust control performance of an adaptive fuzzy controller," Arabian Journal for Science and Engineering, Vol 39(3), pp 2013-2019, 2014. (Impact Factor 1.092)

1. M. B. Kadri, "Rejecting multiplicative input disturbance using fuzzy model free adaptive control," Arabian Journal for Science and Engineering, Vol 39(3), pp 2381-2392, 2014. (Impact Factor 1.092)

1. M. B. Kadri, "Comparison of Least Square identification schemes for a Model Free Fuzzy

Adaptive Controller," Arabian Journal for Science and Engineering, Vol 39(3), pp 2013-2019, 2014. (Impact Factor 1.092)

1. M.B. Kadri, A.L. Dexter, “Fuzzy Relational Control of Uncertain Systems”, International

Journal of Uncertainty, Fuzziness and Knowledge-Based Systems, Vol 22(2), pp 243-261, 2014 (Impact Factor 1.214)

1. M.B. Kadri, W.A.Khan, “Application of genetic algorithms in non-linear heat conduction problems”, The Scientific World Journal, Vol 2014, pp 1-8, 2014 (Impact Factor 1.73).

1. M. B. Kadri, "Disturbance Rejection using Fuzzy Model Free Adaptive Control (FMFAC) with

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# ANNEXURE-O (Book Titles / Magazines / Journals)

**Book Titles for Engineering Students**

**List of mechatronics (Titles)**

|  |
| --- |
| **TITLES** |
| Principles Of Engineering Thermodynamics |
| Advanced Engineering Thermodynamics |
| Engineering Thermodynamics |
| Applied Thermodynamics |
| Enginreeing Thermodynamics |
| Applied Surface Thermodynamics |
| Fundamentals Of Engineering Thermodynamics |
| Advanced Thermodynamics For Engineers |
| Thermodynamics An Engineering Approach Si Units |
| Advanced Thermodynamics Engineering |
| Thermodynamics |
| Fundamental Of Engineering Thermodynamics |
| Heat & Thermodynamics |
| Thermodynamics: An Engineering Approach |
| Basic Engineering Thermodynamics |
| Basics Of Aerothermodynamics |
| Thermodynamics And Engineering Approach |
| Applied Thermodynamics For Engineering Technologies |
| Applied Thermodynamics For Engineering Technologists |
| Engineering Thermodynamics Work & Heat Transfer |
| Principles Of Thermodynamics |
| Intro. To Thermodynamics And Heat Transfer |
| Mechanics & Thermodynamics Of Propulsion |
| Thermodynamics & Heat Power |
| Fundamental Of Electrical Engineering & Electronics |
| Principles Of Machines & Power Electronics |
| Encyclopedic Dictionary Of Electronics |
| Introduction To Pspice Using Orcad For Circuits & Electronics |
| Analog Electronics |
| Basic Mathematics For Electricity & Electronics |
| Fundamental Of Power Electronics |
| Fields & Waves In Communication Electronics |
| Nano Technology & Nano Electronics |
| Grob'S Basic Electronics |
| Basic Electronics |

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| --- |
| Handbook Of Electronics |
| Troubleshooting Consumer Electronics |
| Aircraft Electricity & Electronics |
| Industrial Electronics |
| Microelectronics |
| Applied Electronics |
| A Textbook Of Digital Electronics |
| Allied Electronics |
| Principles Of Digital Electronics |
| Rf Microelectronics |
| Power Electronics |
| Consumer Electronics |
| Digital Computer Electronics |
| Digital Integrated Electronics |
| The Art Of Electronics |
| Text Book On Power Electronics |
| Practical Book On Basic Electronics |
| Digital Computer Electronics |
| Electronics |
| Modern Power Electronics |
| Problems & Solutions In Power Electronics |
| Digital Electronics |
| Text Book Of Applied Electronics |
| Principles Of Electronics |
| Optical Electronics |
| Electricity & Magnetism With Electronics |
| Introduction To Applied Fuzzy Electronics |
| Fundamentals Of Electrical Engineering & Electronics |
| Industrial Electronics & Experiments For Industrial Electronics |
| Chaos In Electronics |
| Grobs Basic Electronics |
| 2000 Solved Problems In Digital Electronics |
| Student Manual: The Art Of Electronics |
| Modern Digital Electronics |
| Grob Basic Electronics |
| Nano Electronics |
| Integrated Electronics |
| Experiments For Industrial Electronics |
| Foundations Of Electronics |
| Fundamentals Of Microelectronics |
| Digital Computer Electronics |
| Dictionary Of Electronics |
| Modern Industrial Electronics |

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| --- |
| Solid State Electronics |
| Art Of Electronics |
| Optoelectronics |
| Introduction To Digital Electronics |
| Problems & Solutions In Integrated Electronics |
| Communication Electronics |
| Micro Electronics |
| Student Manual For The Art Of Electronics |
| Fiber Optics & Optoelectronics |
| Principles Of Power Electronics |
| Power Electronics |
| Circuits And Electronics |
| Mechatronics |
| Mechatronics Mechanical System |
| Text Book Of Mechatronics |
| Mechatronics Mechanical System Interfacing |
| Contronal Systems & Mechatronics |
| Mechatronics A Foundation Course |
| Manual: Dev-2754x Robotics & Mechatronics Work Cell |
| Topics In Mechanical And Mechatronics Engineering |
| Control And Mechatronics |
| A Text Book Mechatronics |
| Mechatronics & Microprocessors |
| Introduction To Mechatronics |
| Robotics, Mechanics & Control |
| Fundamentals Of Robotics |
| Robotics For Engineers |
| Cad/Cam Robotics & Factories |
| Introduction To Robotics |
| Springer Hand Book Of Robotics |
| Introduction To Ai Robotics |
| Decentralized Neural Control: Application To Robotics |
| Mobile Robotics Navigation Control |
| Exploring Robotics With Robotis System |
| Introduction To Robotics Mechanics & Control |
| Robotics Demystified |
| Brains, Behavior & Robotics |
| Industrial Robotics |
| Introduction To Robotics:Mechanics & Control |
| Robotics Mechanics & Control |
| Introduction To Robotics Mechanics And Control |
| Robotics Vision & Controlfundamental Algorithms In Matlab |
| Robotics Technology |

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| --- |
| Manual: Dev-2754x Robotics & Mechatronics Work Cell |
| Decentralized Neural Control Application To Robotics |
| Robotics & Industrial Automation |
| Robotics |
| Robotics Control & Programming |
| Introduction To Industrial Robotics |
| Modern Electrical Equipment For Automobiles |
| Fundamental Of Electrical Engineering & Electronics |
| Basic Electrical Engineering |
| Fundamental Of Electrical Engineering |
| A Textbook Of Electrical Technology |
| Electrical & Mechanical Engineering |
| Utilisation Of Electrical Power |
| Essentials Of Electrical & Computer Engineering |
| Catalog: Electrical, Test, Office & It |
| T/B Of Electrical Technology Vol 2 |
| Electronic & Electrical Measurements & Instrumentation |
| 458 Solutions Of Problems In Electrical Engineering Part 2 |
| Electrical Science |
| T/B. Electrical Technology |
| T/B. Electrical Technology Vol. Iii |
| Laboratory Courses In Electrical Engineering |
| Electrical Power System Design |
| Hand Book Of Electrical Motor System |
| H/B Of Electrical Engineering |
| Introductory Circuits For Electrical & Computer Engineering |
| Objective Electrical Technology |
| Wind Electrical System |
| Catalogue: Electrical Automation & Cables |
| Aircraft Electrical System |
| Electrical Machine & Power System |
| Aircraft Electrical Systems |
| Fundamentals Of Electrical & Electronic Engineering |
| Electrical Power System For Industrial Plants |
| Problems & Solutions In Electrical Machines & Transformers |
| T/B. Electrical Technology Vol.Ii |
| Text Book Of Electrical Tcehnology |
| Essentials Of Electrical & Computer Engineering |
| Electrical, Electronics & Telecommunication Engineering |
| Electrical Technology |
| Aircraft Electrical & Electronic Systems |
| Electrical Engineering |
| Electrical Machines & Power Systems |

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| Introduction To Electrical Engineering Elec1000 |
| Basic Electrical,Electronics Computer Engineering |
| Fundamentals Of Electrical Networks |
| H/B Of Electrical Motor System |
| Fundamentals Of Electrical Engineering |
| Handbook Of Electrical Motor Control System |
| Basic Eletro-Optics For Electrical Engineers |
| Electrical Engineering A Pocket Reference |
| Electrical Machines & Instruments |
| Book Title |
| Report run on: August 9, 2019 |
| Books Title Like %electrical% Page 2 of 3 |
| Electrical & Electronic Technology |
| Electrical Machines,Drives & Power Systems |
| Electrical Machines |
| Electrical Technology Vol. I |
| T/B. Electrical Technology Vol. Iv |
| Electrical Workshop |
| Electrical Technology Vol I |
| Fundamentals Of Electrical Engineering & Electronics |
| Handbook Of Electrical Engineering |
| Probability & Random Process For Electrical Engineering |
| Electrical Enginering Materials |
| Modern Electrical Engineering |
| Design Of Electrical Machine |
| Electrical Drives & Control |
| Electrical Machines-1 |
| Electrical Machines-2 |
| Electrical Machines,Drives & Power System |
| Concise Handbook Of Electronics & Electrical Engineering |
| 500 Solutions Of Prob;Lems In Electrical Engineering Part 1 |
| Electrical Engineering Principles & Applications |
| Electrical Circuits |
| Electrical Engineering Drawing |
| Foundation Of Electrical Engineering |
| Electrical System Designing |
| Electrical Power System |
| Electrical & Electronics Measurement |
| Electrical & Mechanical Services In High Rise Buildings |
| T/B Of Electrical Technology Vol.1 |
| Electrical Electronics & Telecommunication Engineering |
| Electrical Engineering Materials |
| Newnes Electrical Engineers' Hand Book |

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| Hughes Electrical & Electronic Technology |
| Basic Electrical, Electronics & Computer Engineering |
| Electrical Circuits & Machines |
| Design Of Rotating Electrical Machines |
| Principles & Applications Of Electrical Engineering |
| Theory & Problems Of Basic Electrical Engineering |
| Electrical Technology Vol.Ii |
| Principles Of Electrical Engineering |
| Electrical Machine Design Data Book |
| Hughes: Electrical & Electronic Technology |
| Aircraft Electrical And Electronic System |
| Int. To Electrical Conductors,Wiring Techniques & Schematic (Module-4) |
| Electrical Princples For The Electrical Trades |
| Gate Electrical Engineering |
| Process Control Instrumentation |
| Measurement & Instrumentation |
| Measurement And Instrumentation |
| Sensor And Actuators Control System Instrumentation |
| Process Control & Instrumentation |
| Electronic & Electrical Measurements & Instrumentation |
| Manual: Technical Training Systems Instrumentation |
| Modern Electronic Instrumentation |
| Elements Of Electronic Instrumentation |
| Students Reference Manual For Electronic Instrumentation |
| Measurement & Instrumentation |
| Digital Instrumentation |
| Principles Of Industrial Instrumentation |
| Transducers & Instrumentation |
| Introduction To Measurement & Instrumentation |
| Industrial Instrumentation |
| Transducers For Instrumentation |
| Introduction To Measurements & Instrumentation |
| Medical Instrumentation |
| Electronics & Instrumentation |
| Principles Of Electronic Instrumentation |
| Electronic Instrumentation |
| Bioinstrumentation |
| Pc Based Instrumentation |
| Handbook Of Biomedical Instrumentation |
| Principles Of Measurement And Instrumentation |
| Principles Of Measurement & Instrumentation |
| Fundamentals Of Computer Numerical Control |
| Robotics, Mechanics & Control |

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| Power Electronics & Motor Control |
| Essentials Of Fuzzy Modeling & Control |
| Theory & Applicaton Of Automatic Control |
| Power Eletronics & Motor Control |
| Digital Control |
| Quality Control |
| Computer Based Industrial Control |
| Model Reference Adaptive Control |
| Software Measurement: A Visualization Tookit For Projeft Control |
| Electric Machines, Theory, Operations, Applications, Adjustment & Control |
| Fundamentals Of Robitcs Analysis & Control |
| Multivariable Feedback Control |
| Electric Motor Control |
| Statistical Process Control |
| Robust Multivariable Flight Control |
| Robust Hand Gesture Recongition For Robotic Hand Control |
| Flight Stability & Automatic Control |
| Introduction To Statistical Quality Control |
| Adaptive Control |
| Production Planning & Control |
| Process Dynamic & Control |
| Robot Dynamics & Control |
| Mechanical Vibration Practice & Noise Control |
| Fuzzy Control |
| Mobile Robotics Navigation Control |
| Advanced Uav Aerodynamics Flight Stability Control |
| Model Predictive Control |
| Applied Non Linear Control |
| Flight Stability And Automatic Control |
| Cost Accounting Planning & Control |
| Introduction To Robotics Mechanics & Control |
| Cost Management:Accounting & Control |
| Problems & Solutions In Project Management & Control |
| Real-Time Computer Control |
| Robust Flight Control |
| Fundamentals Of Space Craft Attitude Determination And Control |
| Applied Nonlinear Control |
| Programmable Logic Control |
| Introduction To Robotics:Mechanics & Control |
| Introduction To Instrumentation & Control |
| Industrial Electronics & Control |
| Robotics Mechanics & Control |
| Introduction To Robotics Mechanics And Control |

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| Electrical Drives & Control |
| Cost Accounting Planning & Control |
| Industrial Instrumentation & Control |
| Project Planning Scheduking & Control |
| Computer-Based Industrial Control |
| Windows Nt Server : Management & Control |
| Statistical Quality Control |
| Process Dynamics & Control |
| Fundamentals Of Air Traffic Control |
| Aircraft Flight Dynamics And Control |
| Fundamental Limitations In Filtering And Control |
| Automatic Flight Control |
| Adaptive Inverse Control |
| Industrial Electronics & Control |
| Principles Of Process Control |
| Optimal Predictive & Adaptive Control |
| Fundamentals Of Robotic Analysis And Control |
| Fundamentals Of Air Traffic Control |
| Basic Electrical Engineering |
| Numerical Methods For Mathematics Science, & Engineering |
| Fundamental Of Electrical Engineering |
| Fundamental Of Softwaree Engineering |
| Material Science & Engineering |
| Electrical & Mechanical Engineering |
| Essentials Of Electrical & Computer Engineering |
| Television & Video Engineering |
| Foundations For Microwave Engineering |
| Vector Mechanics For Engineering |
| Control Engineering |
| Mythical Man-Month : Essays An Software Engineering |
| Laboratory Courses In Electrical Engineering |
| Precision Engineering |
| Optimization Concepts & Applications In Engineering |
| Automobile Engineering |
| H/B Of Electrical Engineering |
| Digital Systems Engineering |
| Question Book In Electronics & Communication Engineering |
| Introductory Circuits For Electrical & Computer Engineering |
| Integrated Circuit Test Engineering |
| Matlab And Its Applications In Engineering |
| Probability & Statistics In Engineering |
| Control Systems Engineering |
| A Discipline For Software Engineering |

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| Fundamentals Of Electrical & Electronic Engineering |
| Mathematical Methods For Physics & Engineering |
| Power Plant Engineering |
| Neural Engineering |
| Value Engineering |
| Essentials Of Electrical & Computer Engineering |
| Electrical, Electronics & Telecommunication Engineering |
| A First Course On Electronic Engineering |
| Materials Science & Engineering |
| Fundamentals Of Solid State Engineering |
| Handbook Of Electronic Engineering |
| Basic Principles & Calculation In Chemical Engineering |
| Electrical Engineering |
| Fundamentals Of Mechanical Engineering |
| System Engineering |
| Basics Of Electronic Engineering |
| Advanced Thermodynamics Engineering |
| Digital Control Engineering |
| Handbook Of Software Engineering |
| Basic Electrical,Electronics Computer Engineering |
| The Finite Element Method In Engineering |
| Fundamentals Of Electrical Engineering |
| Microwave Engineering |
| Product Design Techniques In Reverse Engineering |
| Foundation For Microwave Engineering |
| Principles Of Communication Engineering |
| Electronics & Communication Engineering |
| Aerospace Engineering |
| Power Plant Engineering |
| Matlab Ang Its Application In Engineering |
| Introduction To Professional Engineering |
| Metrics & Models In Software Quality Engineering |
| Dictionary Of Engineering |
| Text Book Of Thermal Engineering |
| Statistical Engineering |
| Handbook Of Electrical Engineering |
| Numerical Methods For Math, Science & Engineering |
| Digital Transmission Engineering |
| Probability & Random Process For Electrical Engineering |
| Probability And Randmom Processes For Electrical Engineering |
| Radar Sonar & Navigation Engineering |
| Modern Electrical Engineering |
| Schaum'S Outline:Software Engineering |

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| Communication Systems Engineering |
| Microwave & Radar Engineering |
| Radar System Engineering |
| Advanced Design Concepts For Engineering |
| Practical Control Engineering |
| Fundamintals Of Microwave Engineering |
| Basic Control Systems Engineering |
| System Analysis & Design For Software Engineering |
| Business Process Re-Engineering |
| Concise Handbook Of Electronics & Electrical Engineering |
| Question Bank In Electronics & Communication Engineering |
| Understanding Electro Mechanical Engineering |
| Understanding Electro-Mechanical Engineering |
| Object-Oriented Software Engineering |
| Object Oriented Software Engineering |
| Classical & Object Oriented Software Engineering |
| Understanding Electromechanical Engineering |
| Transport, Planning & Traffic Engineering |
| Introduction To Design Engineering |
| Probability & Random Process In Electronic Engineering |
| Question Book In Electric & Electronics Engineering |
| Antenna Engineering |
| Foundation Of Electrical Engineering |
| Communication Engineering |
| Control System Engineering |
| Electrical Electronics & Telecommunication Engineering |
| Thermal Engineering |
| Ethics In Engineering |
| Systems Management For Information Technology & Software |
| Engineering |
| Numerical Methods For Mathematics Science & Engineering |
| Classical & Object-Oriented Software Engineering |
| Introduction To Finite Elements In Engineering |
| Introduction To Finite Elements In Engineering |
| Optimization Concepts & Applications In Engineering |
| Comm: Protocol Engineering |
| Measurement, Instrumentation & Experiment Design In Physics & |
| Engineering |
| Text Book Of Production Engineering |
| Environmental Engineering |
| High Voltage Engineering |
| Basic Electrical, Electronics & Computer Engineering |
| Radar & Laser Cross Section Engineering |

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| Numerical Methods For Engineering |
| Basic Mechanical Engineering |
| Digital System Engineering |
| Object- Oriented Software Engineering |
| Basic Microwave Engineering |
| Topics In Mechanical And Mechatronics Engineering |
| Web Engineering |
| Principles & Applications Of Electrical Engineering |
| Software Engineering |
| Communication Systems Eengineering |
| Communication System Engineering |
| Theory & Problems Of Basic Electrical Engineering |
| Question Bank In Electronic & Communication Engineering |
| Principles Of Electrical Engineering |
| Modern Control Engineering |
| Fundamentals Of Software Engineering |
| Fundamental Of Complex Analysis For Mathematics, Science & Engineering |
| Satellite Communication System Engineering |
| Industrial Engineering |
| Introduction To Probability & Statistics For Engineering |
| Robotic Engineering |
| Introduction To Biomedical Engineering |
| Elements Of Material Sciences & Engineering |
| Discipline For Software Engineering |
| Computer Science Engineering |
| Gate Electrical Engineering |
| Using Uml Software Engineering |
| Classical Electrodynamics |
| Principles Of Engineering Thermodynamics |
| Dynamics Of Structures & Machinery |
| Advanced Engineering Thermodynamics |
| Engineering Thermodynamics |
| Advanced Dynamics |
| Introduction To Electrodynamics |
| Applied Thermodynamics |
| Power System Dynamics & Stability |
| Enginreeing Thermodynamics |
| Basic Aerodynamics |
| Applied Surface Thermodynamics |
| Engineering Mechanics (Statics & Dynamics |
| Aerodynamics For Engineers |
| Low Speed Aerodynamics |
| Fundamentals Of Engineering Thermodynamics |

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| Advanced Thermodynamics For Engineers |
| Engineering Mechanics (Statics & Dynamics) |
| Fluid Dynamics |
| Robot Dynamics & Control |
| Thermodynamics An Engineering Approach Si Units |
| Modern Flight Dynamics |
| Basic Helicopter Aerodynamics |
| Advanced Uav Aerodynamics Flight Stability Control |
| Foundations Of Aerodynamics |
| Advanced Thermodynamics Engineering |
| Aircraft Dynamics |
| Engineering Mechanics Vol 2 Dynamics |
| Dynamics |
| Fundamentals T Of Aerodynamics |
| Thermodynamics |
| Fundamental Of Engineering Thermodynamics |
| Kinematics, Dynamics & Design Of Machinery |
| Computational Fluid Dynamics |
| Flight Dynamics Principles |
| Turbomachinery Fluid Dynamics And Heat Transfer |
| System Dynamics |
| Introduction To Computational Fluid Dynamics |
| Aerodynamics For Aviators |
| Dynamics Of International Business |
| Process Control: Concepts, Dynamics & Applications |
| Heat & Thermodynamics |
| Dynamics Of Structures |
| Compressible Fluid Dynamics |
| Helicopter Flight Dynamics |
| Thermodynamics: An Engineering Approach |
| Basic Engineering Thermodynamics |
| Introduction To System Dynamics |
| Basics Of Aerothermodynamics |
| Handbook Of Fluid Dynamics |
| Space Flight Dynamics |
| Thermodynamics And Engineering Approach |
| Engineering Mechanics (Dynamics) |
| Applied Thermodynamics For Engineering Technologies |
| Applied Thermodynamics For Engineering Technologists |
| Engg Mechanics : Statics & Dynamics |
| Engineering Mechanics Statics & Dynamics |
| Engineering Thermodynamics Work & Heat Transfer |
| Process Dynamics & Control |

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| Aircraft Flight Dynamics And Control |
| Principles Of Thermodynamics |
| Engineering Mechanics Dynamics |
| Applied Themodynamics For Engineering Technologists |
| Mechanics & Electrodynamics |
| Elementary Flight Dynamics |
| Dynamics Of Structures With Matlab |
| Flight Theory And Aerodynamics |
| Aerodynamics For Engineering Students |
| Engineering Machanics Statics & Dynamics |
| Engineering Mechanics Statics And Dynamics |
| Intro. To Thermodynamics And Heat Transfer |
| Engineering Systems Dynamics |
| Fundamentals Of Aerodynamics |
| Mechanics & Thermodynamics Of Propulsion |
| Thermodynamics & Heat Power |
| Engineering Mechanic Dynamics |
| Design With Operational Amplifiers |
| Operational Amplifiers & Linear Circuits |
| Operational Amplifiers & Linear Integrated Circuits |
| Operational Amplifiers With Linear Integrated Circuits |
| Design & Control Of Rf Amplifiers |
| Operational Amplifiers & Their Applications |
| Exploring Solid State Amplifiers |
| Operational Amplifiers & Linear Integrated |
| Operational Amplifiers& Linear |
| Operational Amplifiers & Linear Tc |
| Operational Amplifiers |
| Introduction To Operational Amplifiers |
| Design With Operational Amplifiers & Analog Integrated Circuits |
| Analog Digital Asic Design |
| Analog & Digital Communication |
| Theory & Prohlems Of Analog & Communications |
| Analog Electronics |
| Analog & Digital Signal Processing |
| Analog & Digital Communications |
| Analog And Digital Communications |
| Analog Mos Integrated Circuit For Signal Processing |
| Cmos Analog Circuit Design |
| Textbook Of Operational Transconductance Amplifier & Analog |
| Integrated Circuits |
| Introduction To Analog & Digital Communications |
| Analog Design Essential |

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| Modern Digital & Analog Communications |
| Design Of Analog Filters |
| Analog & Digital Communication Systems |
| Analog Integrated Circuit Design |
| Analog Signal Processing |
| Analog Design Essentials |
| An Introduction To Analog & Digital Communications |
| Analog & Digital Control Systems Design |
| Digital & Analog Communication Ssytem |
| Application & Design With Analog Integrated Circuits |
| Digital & Analog Communication Systems |
| Modern Digital & Analog Communication System |
| Analog Electroncis |
| Current-Mode Vlsi Analog Filter |
| Analog Integrated Circuits |
| Design Of Analog Cmos Integrated Circuit |
| Practical Analog & Digital Fieters Design |
| Analog Communication |
| Design Of Analog Cmos Integrated Circuits |
| Modern Digital And Analog Communication Systems |
| Digilat & Analog Communication Systems |
| Introduction To Analog & Digital Communication |
| Modern Digital & Analog Communication |
| Analysis & Design Of Analog Intergrated Circuits |
| Analysis And Design Of Analog Integrated Circuits |
| Electroncis: Analog & Digital |
| Digital & Analog Techniques |
| Digital & Analogue Techniques |
| Analysis & Design Of Analog Integrated Circuits |
| Analog Vlsi Circuits & Principals |
| Introduction To Analog And Digital Communications |
| Analog Filter Design |
| Design With Operational Amplifiers & Analog Integrated Circuits |
| Modern Digital & Analog Communication Systems |
| Applications & Design With Analog Integrated Circuits |
| Digital & Analog Communication System |
| Digital And Analog Communication System Systems |
| Digital & Analog Technique |
| The 8001 Microcontroller |
| Embeded Microcontroller |
| Microcontrollers |
| Msp430 Microcontroller Basics |
| Microcontroller Idea Book |
| Pic Microcontroller & Embedded System |
| 8051 Microcontroller & Embedded System |
| The 8051 Microcontroller Ane Embedded Systems |
| The 8051 Microcontroller & Embedded Systems |
| Microcontroller |
| 8051 Microcontroller & Embedded Systems |
| Pic Microcontroller And Embedded Systems |
| Interfacing Pic Microcontrollers |
| 8051 Microcontroller |
| Microprocessors & Microcontrollers |
| The Avr Microcontroller And Embedded Systems |
| The 8051 Microcontroller |
| The 8051 Microcontroller And Embedded Systems |
| 8051 Microcontrollers |
| Embedded Microcontroller |
| Microprocessors, Microcontroller & Application |
| Microprocessors And Microcontrollers |
| Design With P/C Microcontroller |
| Design With Pic Microcontroller |
| Advanced Microprocessors & Microcontrollers |
| Microcontroller & Application |
| Introduction To Microprocessors & Microcontrollers |
| Avr Risc Microcontroller Handbook |
| FUNDAMENTALS OF ELECTRIC CIRCUITS |
| FUNDAMENTALS OF ELECTRIC CIRCUITS |
| FUNDAMENTALS OF ELECTRIC CIRCUITS |
| HANDS-ON MACHINE LEARNING WITH SCIKITLEARN', |
| KERAS |
| HANDS-ON MACHINE LEARNING WITH SCIKITLEARN', |
| KERAS |
| HANDS-ON MACHINE LEARNING WITH SCIKITLEARN', |
| KERAS |
| HANDS-ON MACHINE LEARNING WITH SCIKITLEARN', |
| KERAS |
| HANDS-ON MACHINE LEARNING WITH SCIKITLEARN', |
| KERAS |
| POWER ELETRONICS & MOTOR CONTROL |
| POWER ELECTRONICS FOR ENGINEERING |
| A FIRST COURSE IN MATHEMATICAL MODELLING |
| A FIRST COURSE IN MATHEMATICAL MODELLING |
| A FIRST COURSE IN MATHEMATICAL MODELLING |
| WIRELESS COMMUNICATION & NETWORKING |
| FLIGHT CONTROL SYSTEMS |
| MICROPROCESSORS & INTERFACING ( P& H) |
| ELECTRICAL DRIVES & CONTROL |
| NUMERICAL ANALYSIS |
| AIRCRAFT STRUCTURES FOR ENGINEERING |
| AIRCRAFT ELECTRICAL SYSTEM |
| DIGITAL INTEGRATED CIRCUIT DESIGN |
| SYSTEM ENGINEERING |
| PHYSICS OF SEMICONDUCTOR DEVICES |
| MANUFACTURING ENGINEERING AND TECHNOLOGY |
| MANUFACTURING ENGINEERING AND TECHNOLOGY |
| FLIGHT CONTROL SYSTEMS |
| ENGINEERING DESIGN |
| AIR CONDITIONING PRINCIPLES AND SYSTEMS |
| CONTROL SYSTEM: PRINCIPLES & DESIGN |
| AIR CONDITIONING PRINCIPLES & SYSTEMS |
| CONTROL SYSTEMS |
| MODERN CONTROL SYSTEMS |
| MODERN CONTROL SYSTEM |
| INTERCONNECTIONS |
| AUTOMATIC CONTROL SYSTEMS |
| AUTOMATIC CONTROL SYSTEM |
| SYSTEMS ENGINEERING |
| BASIC ELECTRONICS |
| PHYSICS OF SEMICONDUCTOR DEVICES |
| MICROWAVE & WIRELESS COMMUNICATION TECHNOLOGY |
| DIGITAL LOGIC AND COMPUTER DESIGN |
| DIGITAL INTEGRATED CIRCUIT DESIGN |
| PRINCIPLES OF COMPOSITE MATERIAL MECHANICS |
| CONTINUUM MECHANICS FOR ENGINEERS |
| POWER ELECTRONICS LABORATORY |
| AIRCRAFT FLIGHT |
| AIRCRAFT FLIGHT |
| INTRODUCTION TO SELF-DRIVING VEHICLE |
| DESIGNING ROBOT BEHAVIOR IN HUMAN ROBOT |
| INTERACTIONS |
| THOMAS CALCULUS |
| ROBOT OPERATING SYSTEM (ROS) |
| FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE |
| SCIENCE AND ENGINEERING PROJECTSUSING THE |
| ARDUINO AND RASPBERRY |
| DIGITAL FUNDAMENTALS |
| CHANNEL MODELLING IN 5G WIRELESSCOMMUNICATION |
| SYSTEMS |
| POWER ELECTRONICS |
| AUTOMOTIVE TECHNOLOGY |
| ARTIFICIAL INTELLIGENCE STRUCTURES AND STRATEGIES |
| FUNDAMENTALS OF ELECTRIC CIRCUITS |
| FUNDAMENTALS OF ELECTRIC CIRCUITS |
| FUNDAMENTALS OF ELECTRIC CIRCUITS |
| HANDS-ON MACHINE LEARNING WITH SCIKITLEARN', |
| KERAS |
| HANDS-ON MACHINE LEARNING WITH SCIKITLEARN', |
| KERAS |
| HANDS-ON MACHINE LEARNING WITH SCIKITLEARN', |
| KERAS |
| HANDS-ON MACHINE LEARNING WITH SCIKITLEARN', |
| KERAS |
| HANDS-ON MACHINE LEARNING WITH SCIKITLEARN', |
| KERAS |
| POWER ELETRONICS & MOTOR CONTROL |
| POWER ELECTRONICS FOR ENGINEERING |
| A FIRST COURSE IN MATHEMATICAL MODELLING |
| A FIRST COURSE IN MATHEMATICAL MODELLING |
| A FIRST COURSE IN MATHEMATICAL MODELLING |
| WIRELESS COMMUNICATION & NETWORKING |
| FLIGHT CONTROL SYSTEMS |
| MICROPROCESSORS & INTERFACING ( P& H) |
| ELECTRICAL DRIVES & CONTROL |
| NUMERICAL ANALYSIS |
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**Total No. of Titles = 620**

###### List of Foreign & Local Magazine Subscription 2019 to 2020

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|  |  |  |  |  |
| **S.**  **No** |  | **Title** | **Category** | **Frequency** |
| 1 | Forbes |  | Foreign | Monthly |
| 2 | Fotune |  | Foreign | Fortnightly |
| 3 | Reader's Digest |  | Foreign | Monthly |
| 4 | National Geographic |  | Foreign | Monthly |

List of Foreign Journals Subscription 2019 to 2020

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| --- | --- | --- | --- |
| **S. NO.** | **Title** | **Frequency** | **Department** |
| 01. | ACM Transactions On Reconfigurable Technology And Systems | Quarterly | Software Engg. |
| 02. | IEEE Control Systems | Bimonthly | Mechatronics |
| 03. | IEEE Robotics & Automation | Quarterly | Mechatronics |
| 04. | ACM Sensor Networks | Quarterly | Mechatronics |
| 05. | IEEE Aerospace & Electronics Systems | Monthly | Avionics |
| 06. | IEEE Circuits And Systems | Quarterly | Electrical Engg. |
| 07. | ACM Transaction on Computer Human-Interaction | Bimonthly | Software Engg. |
| 08 | IEEE Communications | Monthly | Electrical / Avionics |
| 09 | IEEE Industrial Electronics | Monthly | Electrical/ Avionics/ Mechatronics |
| 10 | IEEE Transaction on Automation Science & Engineering | Quarterly | Mechatronics |
| 11 | IEEE Internet of Things | Quarterly | Software Engg. |
| 12 | IEEE Journal of Solid State Circuits | Monthly | Avionics / Electrical |
| 13 | IEEE/ASME Transaction on Mechatronics | Bimonthly | Mechatronics |
| 14 | ACM Transaction on Software Engineering and Methodology | Quarterly | Software Engg. |
| 15 | IEEE Intelligent System | Bimonthly | Mechatronics / Software Engg. |
| 16 | ACM Transaction on Algorithms | Quarterly | Software Engg. |
| 17 | ACM Transaction on Knowledge Discovery from Data | Quarterly | Software Engg |

Table

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List of Local Magazines Subscription 2019 to 2020

|  |  |  |  |
| --- | --- | --- | --- |
| **S.**  **No** | **Title** | **Category** | **Frequency** |
| 1 | Engineering & Industrial Review | Local | Monthly |
| 2 | Aurora | Local | Monthly |
| 3 | Pakistan & Gulf Economist | Local | Monthly |
| 4 | Slogan | Local | Bimonthly |
| 5 | Herald | Local | Weekly |
| 6 | News Line | Local | Bimonthly |
| 7 | South Asia | Local | Monthly |

List of Local Journals Subscription 2019 to 2020

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| --- | --- | --- | --- |
| **S.**  **No** | **Title** | **Category** | **Frequency** |
| 1 | Pakistan Journal of Scientific & Industrial Research (PJSIR) | Local | Bimonthly |
| 2 | MehranUniversity Research Journal of Engineering | Local | Quarterly |
| 3 | Pakistan Horizon | Local | Quarterly |
| 4 | IBP Journal | Local | Quarterly |
| 5 | Business Review | Local | Semi-annually |
| 6 | Market Forces | Local | Quarterly |
| 7 | Journal of Management & Social Sciences | Local | Quarterly |
| 8 | The Lahore Journal of Economics | Local | Semi-annually |
| 9 | Pakistan Journal of Statistics | Local | Quarterly |

LIST OF NEWSPAPERS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S.**  **No** |  | **Title** | **Category** | **Frequency** |
| 1 | Daily Dawn Karachi |  | Local | Daily |
| 2 | Daily Express Karachi |  | Local | Daily |
| 3 | Daily Duniya Karachi |  | Local | Daily |
| 4 | Business Recorder |  | Local | Daily |
| 5 | Express Tribune |  | Local | Daily |

# ANNEXURE-P (HEC Digital Library Access)

HEC DIGITAL LIBRARY ACCESS

Following is a list of the online information resources with their URLs. Available through the http://digitallibrary.edu.pk/KIET.html.

1. ***ProQuest Dissertation & Theses***
2. ***ASTM***
3. ***BRILL***
4. ***EBRARY***
5. ***IMF LIBRARY***
6. ***SIAM***
7. ***SPRINGERLINK***
8. ***TAYLOR & FRANCIS Journals***
9. ***Wiley-Blackwell Journals***

*Access to HEC digital library using PERN.*

# ANNEXURE-Q (Continuity of Research work)

Continuity of Research Work

**Papers Presented and Published at Refereed International Conferences and Journal by the Faculty Members and Students**

|  |  |  |  |
| --- | --- | --- | --- |
| **Name of Author** | **Title of Paper** | **Name of Journal with Details of Publications** | **Impact Factor** |
| Sameer Qazi and  Muhammad Bilal Kadri | “Revisiting Constraint Based GeoLocation: Improving Accuracy through Removal of  Outliers”, | accepted to appear in International Arab Journal of Information Technology, Vol 15, No 2, Mar 2018 (Online Mar 2017)(ISI indexed with Impact Factor: 0.581). | 0.581 |
| Sameer Qazi , Muhammad Bilal  Kadri1 | Singular Valued  Differential Link Count  Linear  Estimator for Traffic  Matrix of Large Cloud  Computing Networks | 978-1-5386-2969-7/17/$31.00 ©2017 IEEE | Conference |

|  |  |  |  |
| --- | --- | --- | --- |
|  | Model-Free Fuzzy  Adaptive Control for  MIMO Systems | Received: 10 April 2016 / Accepted: 19 January  2017© King Fahd University of Petroleum &  Minerals 2017 | Book Chapter |
| Shujaat Khan,  Muhammad Usman ,  Jawwad Ahmad ,  Imran Naseem and  Muhammad  Moinuddin | FCLMS: Fractional  Complex LMS  Algorithm for Complex  System Identification | 13th IEEE colloquium on Signal Processing and its applications (CSPA-2017) http://www.asprg.net/cspa2017/ | Conference |
| Adil Loya | Problems Faced While  Simulating Nanofluids | Additional information is available at the end of the chapter- year 2017 http://dx.doi.org/10.5772/66495 | Book chapter |

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| Muhammad  Saleheen Aftab and Muhammad Shafiq | Lyapunov Function  Based Neural  Networks for Adaptive  Tracking of Robotic Arm | International Journal of Materials, Mechanics and Manufacturing, Vol. 5, No. 1, February 2017 | Conference |
| Muhammad Saeed,  Samiya Loya and Adil  Loya\* | A Review on Strategic  Positioning of Bottleneck  around the Customer  Order Decoupling  Point and  Issues on Production  Planning in Supply  Chain | DOI 10.1515/jmsp-2016-0020  Received June 17, 2016; accepted November 2,  2016; previously published online November 24,  2016 | 0.55 |
| Adil Loya,  Muhammad Zia Ullah  Khan, Rumeel Ahmad  Bhutta, Muhammad  Saeed | Dependency of Torque on Aerofoilcamber  Variation in Vertical Axis Wind Turbine | World Journal of Mechanics, 2016, 6, 472-486 http://www.scirp.org/journal/wjm  ISSN Online: 2160-0503 | 0.81 |

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| --- | --- | --- | --- |
|  |  | ISSN Print: 2160-049X |  |
| A.Loya, Kamran  Maqsood,  Muhammad Duraid | Quantification of  Aerodynamic Variables  Using Analytical  Technique and  Computational Fluid  Dynamics | ICCFD 2018 |  |
| A.Loya, Siraj Anis,  Muhammad Arsalan  Khan, Ali R. Jafri. | Data communication with flightgear using simulink in real time over a udp protocol | The Future Reality of Flight Simulation, Royal Aeronautical Society Conference 2019. |  |
| A. Loya, J.L. Stair, G.  Ren | Simulation and experimental study of rheological properties of CeO2 water nanofluid | WCPT7 2014. |  |
| Muhammad Tauseef  Nasir, Kyung  Chun Kim, | Working Fluid Selection and Parametric  Optimization of an  Organic Rankine Cycle  Coupled  Vapor Compression  Cycle (ORC-VCC) for  Air Conditioning Using  Low Grade Heat", | Energy and Buildings 129 (2016). | 4.07 |
| Raees,A. , Kadri, M.B.,  Jumani, N., Pirwani,N | "Inverse  Fuzzy Modeling for the Cancellation of Nonlinearity in  Unknown  Hammerstein Model , | The 6th International Conference on Innovative Computing Technology (INTECH 2016), 19th 21st September2016, Islamabad, Pakistan. | Conference |

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| Dr Shafiq R Qureshi  Qaisar Ali  Dr Waqar A Khan | Effects of radiations on mixed convection in power law fluids along vertical Wedge embedded in a saturated porous medium under  prescribed heat flux conditions | Presented in “14th International Conference on Simulation and Experiments in Heat Transfer and its applications” held from 7-9 Sep 2016 at Ancona, Italy | Conference |

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| Muhammad Saleheen  Aftab and  Muhammad Shafiq | Adaptive PID  Controller based on Lyapunov  Function Neural  Network for Time  Delay  Temperature Control | Proceedings of the 8th IEEE GCC Conference and  Exhibition, Muscat, Oman, 1-4 February, 2015 | Conference |
| Dr.Loya, and G.Ren, | Molecular dynamics simulation study of rheological properties of CuO-water nanofluid. | 2015 J. Mater. Sci., 50: 4075-4082. [CrossRef](http://dx.doi.org/10.1007/s10853-015-8963-7) | [Direct Link](http://link.springer.com/article/10.1007/s10853-015-8963-7)  | | 2.3 |

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| MMA Baig, SA Qazi,  MB Kadri | [Discriminative](https://scholar.google.com.pk/citations?view_op=view_citation&hl=en&user=6ZPm728AAAAJ&cstart=20&citation_for_view=6ZPm728AAAAJ:7PzlFSSx8tAC)  [Training for Phonetic](https://scholar.google.com.pk/citations?view_op=view_citation&hl=en&user=6ZPm728AAAAJ&cstart=20&citation_for_view=6ZPm728AAAAJ:7PzlFSSx8tAC)  [Recognition of the](https://scholar.google.com.pk/citations?view_op=view_citation&hl=en&user=6ZPm728AAAAJ&cstart=20&citation_for_view=6ZPm728AAAAJ:7PzlFSSx8tAC)  [Holy Quran](https://scholar.google.com.pk/citations?view_op=view_citation&hl=en&user=6ZPm728AAAAJ&cstart=20&citation_for_view=6ZPm728AAAAJ:7PzlFSSx8tAC) | Arabian Journal for Science and Engineering 40  (9), 2629-2640 (2015) | 0.72 |
| MB Kadri, S Nisar, SZ  Khan, WA Khan | [Comparison of ANN and finite element model for the prediction of thermal stresses in diode laser cutting of float glass](https://scholar.google.com.pk/citations?view_op=view_citation&hl=en&user=6ZPm728AAAAJ&cstart=20&citation_for_view=6ZPm728AAAAJ:QIV2ME_5wuYC) | Optik-International Journal for Light and Electron  Optics 126 (19), 1959-1964 (2015) | 0.76 |
| Makbul A.M. Ramli  Kashif Ishaque Faizan  Jawaid  Yusuf A. Al-Turki  Zainal Salam | Title: A modified differential evolution based maximum  power point tracker for photovoltaic system under partial shading condition | [http://dx.](http://dx/)doi.org/doi:10.1016/j.enbuild.2015.06. 058 Reference: ENB 5964  Applied Energy Elsvier,2015 | 5.74 |
| VJ Chin, Z Salam, K  Ishaque | [Cell modelling and model parameters estimation techniques for photovoltaic simulator application: A review](https://scholar.google.com.pk/citations?view_op=view_citation&hl=en&user=WOtDP30AAAAJ&cstart=20&citation_for_view=WOtDP30AAAAJ:Wp0gIr-vW9MC) | Applied Energy 154, 500-519 (2015) | 5.6 |
| VJ Chin, Z Salam, K  Ishaque | [An accurate two diode model computation for CIS thin film PV module using the hybrid approach](https://scholar.google.com.pk/citations?view_op=view_citation&hl=en&user=WOtDP30AAAAJ&cstart=20&citation_for_view=WOtDP30AAAAJ:dhFuZR0502QC) | Electric Power and Energy Conversion Systems  (EPECS), 2015 4th International (2015) | 5.6 |
| VJ Chin, Z Salam, K  Ishaque | [An improved method to estimate the parameters of the single diode model of photovoltaic module using differential evolution](https://scholar.google.com.pk/citations?view_op=view_citation&hl=en&user=WOtDP30AAAAJ&cstart=20&citation_for_view=WOtDP30AAAAJ:QIV2ME_5wuYC) | Electric Power and Energy Conversion Systems  (EPECS), 2015 4th International | Conference |

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| --- | --- | --- | --- |
| M. S. Aftab, M.  Shafiq, and F. Aftab, | “A Lyapunov Function  Neuro-Adaptive  Controller for LFC in  Two-Area Power  System” | 41st Annual Conference of the IEEE Industrial Electronics Society, Yokohama, Japan, November 9-12 2015. | Conference |
| M. S. Aftab, and M.  Shafiq, | “Neural Networks for  Tracking of Unknown  SISO Discrete-time  Nonlinear Dynamic  Systems”, | ISA Transactions, Volume 59, November 2015, Pages 363-374, ISSN 0019-0578,  [http://dx.](http://dx/)doi.org/10.1016/j.isatra.2015.09.003.(I mpact Factor: 2.98). | 2.98 |

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| Loya, A.,J.L. Stair and  G. Ren, | Simulation and experimental study of rheological properties of CeO2-water nanofluid. | 2014. Int. Nano Lett, 5: 1-7. | 1.76 |
| M. S. Aftab, M.  Shafiq, | “Lyapunov Function  Based Neural  Networks for Adaptive  Tracking of Robotic  Arm”, | 2nd International Conference on Control, Mechatronics and Automation (ICCMA), December 8-10, 2014. | Conference |
| Wqar A.Khan, Malik  M.Imran, Qaisar Ali. | Effects of radiations on mixed convection Along Vertical Cylinder with uniform surface heat flux in a porous medium | Original Manuscript Submitted : 1/2/12; Final  Draft Received 5/6/2013 |  |
| M. Farhan uz zaman Siddiqui, Hussain zafar , Fahad Khan, Hussain Dawson | Metal Detection and  Bomb Disposal  Robotic Vehicle | Sixth International Conference on  Aerospace Science and Engineering  (ICASE 2019)  November 12 – 14, 2019  Institute of Space Technology, Islamabad, Pakistan | Conference |
| Sofia Yousuf,  Muhammad Bilal  Kadri | Sensor Fusion of INS,  Odometer and GPS for  Robot Localization | IEEE Conference on Systems, Process and Control (ICSPC 2016), 16-18  December 2016 Melaka, Malaysia. | Conference |
| Sofia Yousuf,  Muhammad Bilal  Kadri | Comparison of two different model free fuzzy control architectures based on inverse plant modeling | International Conference On Latest trends in Electrical Engineering &  Computing Technologies (INTELLECT 2017) , 15 - 16 November 2017, Karachi, Pakistan. | Conference |
| Yousuf,S., Kadri,M.B. | Robot Localization in Indoor and Outdoor  Environments by  Multi-sensor Fusion | 14th IEEE International Conference on  Emerging Technologies (ICET 2018), 21 -22nd November, 2018, Islamabad, Pakistan. | Conference |
| Bushra, Hai, T., Kadri, M.B. | Comparison of different techniques for experimental modeling of a Quadcopter | Second International Conference On  Latest trends in Electrical Engineering &  Computing Technologies (INTELLECT 2019) , 13 - 14 November 2019, Karachi, Pakistan. | Conference |
| Tanveer, F., Kadri, M.B., Jumani, N., Pirwani,N. | Fuzzy based tuning of a Sensor Fusion based  Low Cost Attitude  Estimator | The 6th International Conference on  Innovative Computing Technology  (INTECH 2016), 19th -21st September 2016, Islamabad, Pakistan | Conference |
| Sami,A., Kadri, M.B., Jumani, N., Pirwani,N. | Design & simulation of fuzzy PID for hydro power plant Speed Control Using Fuzzy  PID | The 6th International Conference on  Innovative Computing Technology (INTECH 2016), 19th -21st September 2016, Islamabad, Pakistan. | Conference |
| Raees,A. , Kadri, M.B., Jumani, N., Pirwani,N. | Inverse Fuzzy  Modeling for the  Cancellation of  Nonlinearity in  Unknown  Hammerstein Model | The 6th International Conference on  Innovative Computing Technology (INTECH 2016), 19th -21st September 2016, Islamabad, Pakistan. | Conference |