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To the Minutes of Meeting CE/BOF-J E&S/25/002
21 May 2025

HITEC UNIVERSITY OUTCOME BASED EDUCATION (OBE) FRAMEWORK

HITEC University Taxila

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University Vision

HITEC University shall be a premier institution and bastion of academic excellence. It must become a citadel of our ideological moorings, national integration and socio-religious values. HITEC University ought to trigger the human mind to think clearly perceiving the environment and issues confronting human beings, seeking intelligent, viable and practical solutions, leading to societal development and the overall betterment of human race. The campus shall provide our progeny the environment for intellectual flourishment, nurturing fertility of thought and creativity. HITEC University faculty will focus on preparing our youth to face the challenges of life with honor, confidence and fortitude through character building and grooming. In HITEC University merit, justice, honesty and adherence to moral and social values must prevail. The University shall provide a pedestal for fulfillment of our youth's aspirations and hopes to live an honorable life as citizens of Pakistan.

University Mission

HITEC University will be a centre of excellence in teaching, learning and research. We instill and inspire intellectual curiosity, a lifelong quest for knowledge and a keen urge for social and moral responsibility. The University will establish strong linkages with industry, ensuring innovative research leading to economic prosperity of Pakistan.

Faculty of Engineering Mission

Endure to propagate knowledge and perpetuate truth for prosperity.

Department of Computer Engineering Mission

Build a strong foundation in the field of Computer Engineering in an amiable and professional learning environment, emphasizing the development of essential skills and competencies to prepare students to face the challenges of current and future technological advancements commensurate with the social and ethical values of the society.

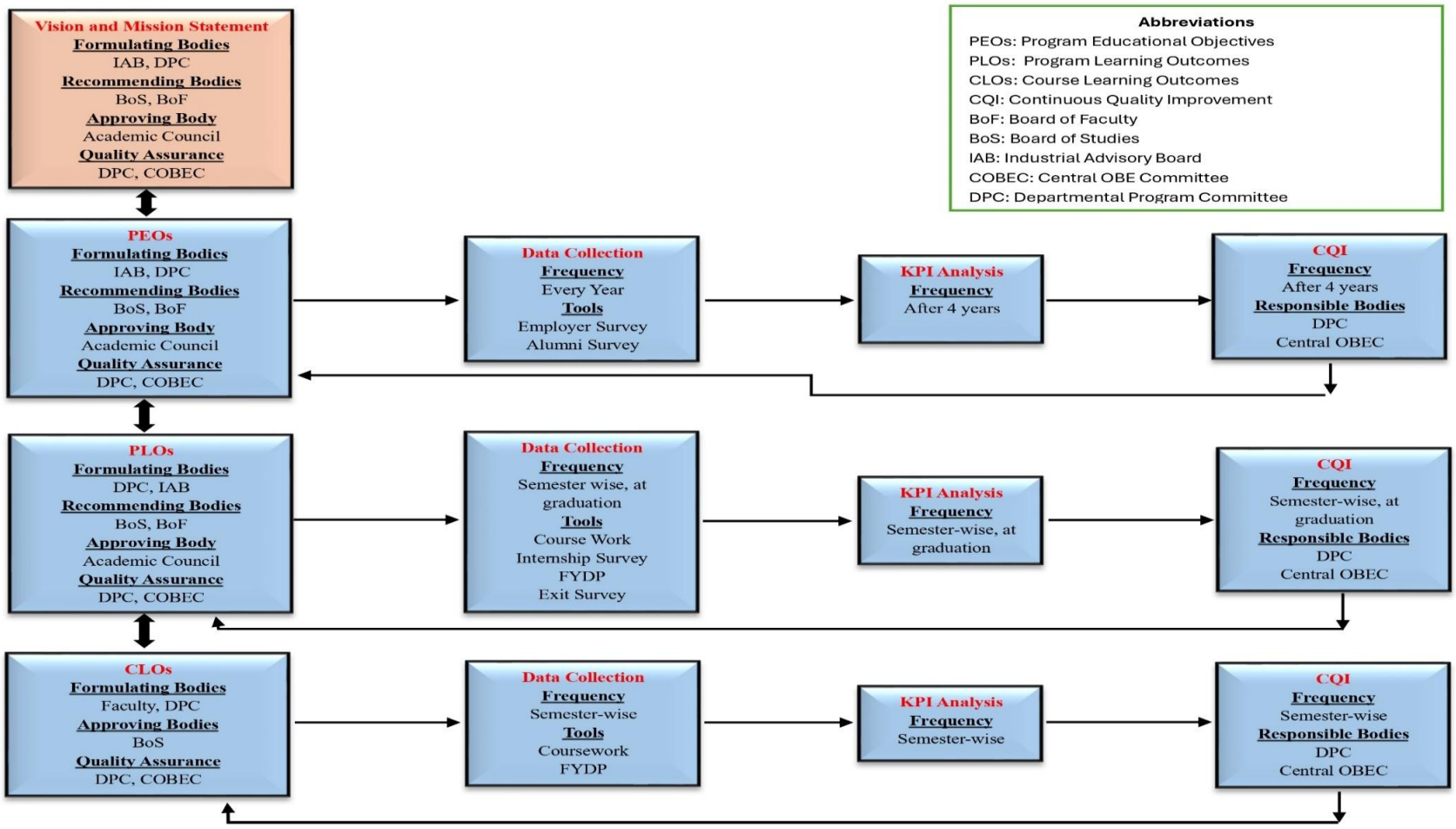
1. HITEC University

HITEC University is a private sector university. In November 2007, classes were commenced in affiliation with the University of Engineering and Technology, Taxila with an intake of 250 students. The University was granted its own charter in November 2009 by the Government of the Punjab. The University is sponsored by Heavy Industries Taxila Education Welfare Trust (HITEWT). The undergraduate programs include BS Electrical Engineering, BS Mechanical Engineering, BS Computer Engineering, BS Civil Engineering, BS Biomedical Engineering, BS Computer Science, BS Software Engineering, BS Islamic Studies, BS Mathematics, BS Accounting and Finance, BS Robotics and Automation, BS in IoT and BBA. Besides these programs, masters and doctoral programs in Electrical Engineering, Mechanical Engineering, Computer Engineering, Computer Science, Mathematics and Islamic Studies are also being offered.

With new technologies and businesses emerging at a faster pace, the gap between the developing and the developed nations of the world continues to widen. HITEC University, right from its inception, has been working to promote human resource development for bridging this gap. By providing undergraduate and graduate level education, HITEC University aims to address the industrial and business needs of the country. Every program strongly focuses on quality education and ensures that the gap between academia and industry is well bridged.

Students at HITEC University get ample opportunities for internships and employment due to close proximity of the University to Heavy Industries Taxila, Pakistan Ordinance Factories, Heavy Mechanical Complex, Pakistan Aeronautical Complex, Kamra, Telephone Industries of Pakistan and FECTO Cement, etc. In addition to its emphasis on quality education, the University also assigns equal importance to character building, extra-curricular and co-curricular activities. We aim to make our students morally, physically and mentally sound individuals and responsible citizens of Pakistan with a strong urge of service to humanity at national and international levels.

2. OBE Framework Block Diagram



3. OBE in Computer Engineering Department

Initially, the BSCE program was following the 2007 accreditation system imposed by PEC for accreditation. In Fall-16 (2017), the department started to shift towards the OBE system on a fast track and conducted a successful PEC accreditation visit in April 2018. After the accreditation of Batch 2014 and 2015, Batch 2016 had provisional accreditation during the pandemic. PEC accreditation visit conducted in Fall-2021 for Batch 2017, 2018 and 2019. The outcome of this PEC visit was in the form of accreditation under the PEC OBE-based manual 2017. The department took the following remedial steps to comply with the observations of the PEC visitation team.

Last PEC re-accreditation visit conducted in Fall 2023 for Batch 2020 and 2021. Re-accreditation is granted for Intake Batch 2020.Re-accreditation is also recommended for Intake Batch 2021 subject to submission of a satisfactory compliance report along with evidence(s) or major observations, particularly in Criteria-3 & 9, mentioned in the detailed report. The department took the following remedial steps to comply with the observations of the PEC visitation team.

4. Accreditation Profile

Computer Engineering Department

Year of PEC Visit	Decision
Zero Visit — 21st April 2014	Permission is granted to launch the program w.e.f. Fall-2014. Intake must be restricted to 40 students per year. Necessary faculty hired for the program must be intimated to PEC before launching the new program. Observations of the visiting team must be addressed accordingly for onward verification during interim/accreditation visits by PEC.
Interim Visit — 21st July 2016	Permission is granted to continue the program. The observations/weak areas identified by the PEC visitation team must be addressed. Further to observe CQI, the university/institute has to

	submit a separate progress report along with evidence to PEC, while applying for a subsequent visit.
Accreditation Visit — 23, 24th April 2018	Based on the satisfactory level of compliance against accreditation criteria/quality standards, particularly the breadth and depth of the curriculum, QMS, implementation of the Outcome Based Assessment procedures & CQI, Accreditation is granted for two years, i.e., Intake Batches 2014 & 2015 under Level-II of First Schedule.
Provisional Accreditation during Pandemic, 2020	Pakistan Engineering Council gave provisional accreditation for the batch 2016 intake. The visit was not conducted due to the pandemic lockdown. The decision was communicated vide letter PEC/EAD/HITEC-T/COM/DL (97th) -2020 dated 03 Aug 2020.
Re-accreditation Visit — 14, 15th June 2021	Based on the satisfactory level of compliance against accreditation criteria/ quality standards and implementation of the Outcome Based Assessment procedures & CQI, accreditation is granted for three years i.e., Intake Batches 2017 to 2019 under Level-II.
Re-accreditation Visit 2023	Based on the satisfactory level of compliance, triangulation of breadth and depth of the program QMS, CQI and implementation of the OBE system, the EAB decided as follow: i. Re-accreditation is granted for Intake Batch 2020. ii. Re-accreditation is also recommended for Intake Batch 2021 subject to submission of a satisfactory compliance report along with evidence(s) or major observations, particularly in Criteria-3 & 9, mentioned in the detailed report.

5. Central OBE Committee

The Central OBE Committee (COBEC) is responsible for the overall monitoring of the outcome-based education in the University. The composition of the committee is given below:

S. No.	Name	Status
1.	The Vice Chancellor	Chairman
2.	All Deans	Member
3.	Director QA&C	Member
4.	Two Chairpersons (to be nominated by the Vice Chancellor)	Member
5.	Deputy Director QA&C	Member/Secretary

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Responsibilities:

1. Policy decisions regarding OBE
2. Implementation/monitoring of the outcome-based education in the University.
3. To monitor/examine the proceedings of the departmental program committee.
4. To examine SAR prepared by the department before submission to PEC
5. Any other relevant task in context of OBE.

6. Departmental Program Committee (DPC)

The Departmental Program Committee (DPC) is responsible for the overall monitoring of the program. The composition of the committee is given below:

S. No.	Name	Status
1.		Convener
2.	DQEC Head	Member
3.		Member
4.		Member
5.		Member/Secretary

Formulation:

1. Chairperson of respective department shall propose the committee
2. Dean of the concerned Faculty shall approve the committee and,
3. Registrar shall notify the committee.

Responsibilities:

1. To manage and review the continuous improvement processes of program.
2. To review and recommend to BoS any actions or changes suggested by Departmental Quality Enhancement Cell (DQEC).
3. To assess the achievement of program objectives, outcomes and curriculum from the data provided by DQEC.
4. Preparation of SAR in coordination with all concerned stake holders.
5. Any other relevant task assigned by the Chairperson.

7. Departmental Quality Enhancement Cell (DQEC)

The composition of the committee is given below:

S. No.	Name	Status
1.	Engr. Tehseen Ahsan	Officer In charge
2.	Engr. Kayynat Rana	Member
3.	Engr. Qasim Javed	Member
4.	Engr. Maryam Farooq	Member
5.	Engr. Sara Rehman	Member
6.	Engr. Sadam Hussain	Member
7.	Engr. Sana Nasir	Member
8.	Engr. Hareem Khan	Member/Secretary

Responsibilities for DQEC

1. The DQEC shall function under the Chairperson of the department.
2. Coordination in teaching and learning activities amongst the stakeholders in the Department/ University.
3. Implementation of policies/ decision issued by the University.
4. Continuous Quality Improvement CQI analysis under OBE.

a) CQI at CLO Level

- To verify that CLOs of the subject are in line with approved PLOs and Bloom Taxonomy levels.
- To analyze CLO assessment methods and tools.
- To recommend and report to the DPC for appropriate actions of continuous quality improvement at CLO level for each subject after reviewing the results of CLO attainments and instructor course feedback form.
- Any other work assigned by DPC related to CLO attainment and assessments.

b) CQI at PLO level

- To conduct CQI of PLOs at individual and cohort level
- To collect and evaluate PLO attainment data every semester.
- To review PLO attainment data at student level every semester and forward the report to Student Mentors (SM) for individual student PLO review and mentoring.
- To collect the signed corrective action forms from SM and keep the updated record.
- To review subject PLO attainment data at cohort level every semester.
- To evaluate and review the graduating students and employer internship surveys in coordination with Directorate of QA&C for indirect assessment of PLOs.
- To analyze PLO assessment methods and tools.
- To verify the course folders, record for PLO attainment.

- To recommend and report the DPC for appropriate actions of continuous quality improvement of PLO at cohort level after reviewing the results of direct and indirect PLO assessments.
- Any other work assigned by DPC related to PLO attainment and assessments.

c) CQI at PEO level

- To evaluate and review alumni, exit and employer survey data in coordination with Directorate of QA&C for indirect assessment of PEOs.
- To keep the record/database of all alumni and employer and the updating of these databases every year.
- To recommend and report the DPC for appropriate actions of continuous quality improvement at PEO level.
- Any other work assigned by DPC related to PEO attainment and assessments.

Program Educational Objectives (PEOs)

After five years, the graduates of the program will be able to exhibit the following computational skills:

PEO-1: Our graduates will be skilled computer engineers who succeed in industry, academia, or run their own businesses, with a strong sense of ethics and adaptability to new technologies.

PEO-2: They will keep up with new technologies and create smart solutions to real-world problems.

PEO-3: They will be trained to behave professionally towards the society and environment within their organizations.

PEO-4: They will interact with others respectfully, uphold integrity, and demonstrate a strong commitment to social responsibility.

The departments may opt above mentioned PEOs or formulate their own keeping in view the mission and goals of their programs and shall get approval from statuary bodies by observing coral formalities.

8. Mapping of PEOs to University and Departmental Vision and Mission

`	Vision and Mission	Program Educational Objectives (PEOs)			
		PEO-1	PEO-2	PEO-3	PEO-4
University Vision	HITEC University shall be a premier institution and bastion of academic excellence. It must become a citadel of our ideological moorings, national integration and socio-religious values. HITEC University ought to trigger the human mind to think clearly perceiving the environment and issues confronting human beings, seeking intelligent, viable and practical solutions, leading to societal development and the overall betterment of human race. The campus shall provide our progeny the environment for intellectual flourishment, nurturing fertility of thought and creativity. HITEC University faculty will focus on preparing our youth to face the challenges of life with honor, confidence and fortitude through character building and grooming. In HITEC University merit, justice, honesty and adherence to moral	✓	✓	✓	✓

	and social values must prevail. The University shall provide a pedestal for fulfillment of our youth's aspirations and hopes to live an honorable life as citizens of Pakistan.				
University Mission	HITEC University will be a centre of excellence in teaching, learning and research. We instill and inspire intellectual curiosity, a lifelong quest for knowledge and a keen urge for social and moral responsibility. The University will establish strong linkages with industry, ensuring innovative research leading to economic prosperity of Pakistan.	✓	✓	✓	✓
Faculty of Engineering Vision	Endure to propagate knowledge and perpetuate truth for prosperity.	✓	✓	✓	✓
Program's Mission	Build a strong foundation in the field of Computer Engineering in an amiable and professional learning environment, emphasizing the development of essential skills and competencies to prepare students to face the challenges of current and future	✓	✓	✓	✓

	technological advancements commensurate with the social and ethical values of the society.				

9. Program Learning Outcomes (PLOs)

PLO-1	**Engineering Knowledge:** Apply knowledge of mathematics, natural science, engineering fundamentals and Engineering specialization to the solution of complex engineering problems **(WK-1-WK-4).**
PLO-2	**Problem Analysis:** Identify, formulate, conduct research literature, and analyze Complex Engineering Problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences **(WK-1 -WK-4)** -
PLO-3	**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 safely, cultural, societal, and environmental considerations **(WK-5).**
PLO-4	**Investigation:** Conduct investigation of Complex Engineering Problems using research-based-knowledge and research methods, including design or experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions **(WK-8).**
PLO-5	**Tool Usage:** Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, to Complex Engineering Problems, with an understanding of the limitations **(WK-2 and WK-6)**.
PLO-6	**The Engineer and the World**: Analyze and evaluate sustainable development impacts Lo society, the economy, sustainability, health and safely, legal frameworks, and the environment while solving complex engineering problems **(WK-1, WK-5, and WK-7).**
PLO-7	**Ethics:** Apply ethical principles and commit to professional ethics and norms of engineering practice and adhere 10 relevant national and international laws. Demonstrate an understanding of the need for diversity and inclusion **(W K-9).**
PLO-8	**Individual and Collaborative Team Work**: Function effectively as an individual, and as a member or leader in diverse and inclusive learns and in multi-disciplinary, face-to-face, remote and distributed settings **(WK-**

	9).
PLO-9	**Communication:** Communicate effectively and inclusively on complex engineering activities with the engineering community and with swiety al large, such as being able to comprehend and write effective reports and design documentation, and make effective presentations, taking into account cultural, language, and learning differences **(WK-1 and WK-9).**
PLO-10	**Project Management and Finance:** Demonstrate knowledge and understanding of engineering management principles and economic decision-making and apply these 10 one's own work, as a member and leader in a learn, to manage projects in multidisciplinary environments (WK-2 and WK-5).
PLO-11	**Lifelong Learning:** Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change (WK-8 and WK-9).

10. Mapping of PLOs to PEOs

PLOs		PEOs			
		PEO-1	PEO-2	PEO-3	PEO-4
PLO-1	Engineering Knowledge	✓			
PLO-2	Problem Analysis		✓		
PLO-3	Design/Development of Solutions		✓		
PLO-4	Investigation		✓		
PLO-5	Tool Usage		✓		
PLO-6	The Engineer and the World				✓
PLO-7	Ethics				✓
PLO-8	Individual and Collaborative Team Work			✓	
PLO-9	Communication			✓	
PLO-10	Project Management and Finance			✓	
PLO-11	Lifelong Learning		✓		

11. Mapping of Bachelor of Engineering Program with Sustainable Development Goals (SDGs)

Sr. No.	Description	SDGs																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	HEI vision and mission with focus on specific engineering program				✓	✓			✓	✓	✓		✓					✓
2	Bachelor of Engineering Curriculum (Engg. & Non-Engg. Courses)				✓	✓		✓	✓	✓	✓	✓	✓	✓				✓
3	Final Year Design Project (FYDP)			✓			✓	✓		✓	✓	✓		✓			✓	
4	Other pre-requisite activities (Internship, Community service, Survey camp, etc.)	✓	✓	✓	✓		✓						✓			✓		
5	Co- and Extra-Curricular Activities																	

12. Engineering Competencies (ECs)

EC-01	**Comprehend and apply universal knowledge**: Comprehend and apply advanced Engineering knowledge of the widely-applied principles underpinning good practices.
EC-02	**Comprehend and apply local knowledge**: Comprehend and apply advanced Engineering knowledge of the widely-applied principles underpinning good practice specific to the jurisdiction of practices.
EC-03	**Problem analysis**: Define, investigate and analyze complex Engineering problems using data and information technologies where applicable.
EC-04	**Design and development of solutions**: Design or develop solutions to complex Engineering problems considering a variety of perspectives and taking account of stakeholder views.
EC-05	**Evaluation**: Evaluate the outcomes and impacts of complex Engineering activities.
EC-06	**Protection of society**: Recognize the foreseeable economic, social, and environmental effects of complex Engineering activities and seek to achieve sustainable outcomes.
EC-07	**Legal, regulatory, and cultural**: Meet all legal, regulatory, and cultural requirements and protect public health and safety in the course of all Engineering activities.
EC-08	**Ethics**: Conduct Engineering activities ethically.
EC-09	**Manage engineering activities**: Manage part or all of one or more complex Engineering activities.
EC-10	**Communication and Collaboration**: Communicate and collaborate using multiple media clearly and inclusively with a broad range of stakeholders in the course of all Engineering activities.
EC-11	**Continuing Professional Development (CPD) and Lifelong learning**: Undertake CPD activities to maintain and extend competences and enhance the ability to adapt to emerging technologies and the ever- changing nature of work.
EC-12	**Judgement**: Recognize complexity and assess alternatives in light of competing requirements and incomplete knowledge. Exercise sound judgement in the course of all complex Engineering activities.
EC-13	**Responsibility for decisions**: Be responsible for making decisions on part or all of complex Engineering activities.

13. Scheme of Studies

BSCE Program Semester-wise Breakdown

SEMESTER-1		
Code	Course Title	CH
BS-101	Engineering Physics	3+0
HS-101	English	3+0
MT-101	Calculus & Analytic Geometry	3+0
EE-102	Electric Circuit Analysis	3+1
HS-102	Pakistan Studies	2+0
EC-110	Computing Fundamentals	2+1
QT-101	Translation of the Quran: Beliefs	1+0 (NC)
Total Credit		18
SEMESTER-2		
EE-101	Engineering Workshop	0+1
HS-103	Communication Skills	3+0
EC-111	Programming Fundamentals	3+1
EE-205	Electronic Devices and Circuits	3+1
EC-225	Discrete Structures	3+0
MT-303	Applied Linear Algebra	2+0
Total Credit		17
SEMESTER-3		
MT-103	Differential Equations	3+0
EC-121	Digital Logic Design	3+1
HS-201	Technical Report Writing	3+0
HS-203	Community Service	0+1 (NC)
IS-211	Islamic Studies	2+0
ME-211	Computer Aided Engineering Design	0+1
EC-230	Object Oriented Programming	3+1
QT-201	Translation of the Quran : Worships	1+0 (NC)
Total Credit		17
SEMESTER-4		
MT-201	Complex Variables and Transforms	3+0
EC-201	Engineering Project Management	3+0
EC-222	Data Structures & Algorithms	3+1
EC-223	Signals and Systems	3+1
EC-228	Computer Architecture and Organization	3+1
Total Credit		18
SEMESTER-5		
MT-202	Numerical Methods	2+1
CS-204	Software Engineering	3+0
EC-332	Computer Communication Networks	3+1
EC-333	Microprocessor and Interfacing Techniques	3+1
EC-334	Database Systems	3+1
QT-301	Translation of the Quran: Moral Values	1+0(NC)
Total Credit		18
SEMESTER-6		
MT-302	Probability and Statistics	3+0
EC-231	Operating Systems	3+1
EC-341	Digital System Design	3+1
EC-390	Digital Signal Processing	3+1
xx-xxx	EC Depth Elective - I	2+1
Total Credit		18
SEMESTER-7		
HS-401	Professional Values & Ethics	2+0
HS-403	Management and Entrepreneurship	3+0
HS-404	Foreign Language	1+1
xx-xxx	EC Depth Elective - II	2+1
xx-xxx	IDEE - I	2+1
EC-499	Final Year Project - I	0+3
QT-401	Translation of the Quran: Dealing and Commandments	1+0(NC)
Total Credit		16
SEMESTER-8		
HS-402	Economics	2+0
ME-407	Health Safety and Environment	1+0
xx-xxx	EC Depth Elective - III	2+1
xx-xxx	EC Depth Elective - IV	2+1
xx-xxx	IDEE - II	2+1
EC-499	Final Year Project - II	0+3
Total Credit		15

Major Engineering Electives:			
Code	**Course Title**	**C. H**	**Category**
EC-350	Control Engineering	3+0	Major
EC-442	Embedded Systems	2+1	Major
EC-444	Parallel and Distributed Computing	2+1	Major
EC-445	System Programming	2+1	Major
EC-448	Introduction to Robotics	2+1	Major
EC-465	Software Project Management	2+1	Major
EC-467	Mobile Application Development	2+1	Major
CS-305	Computer Graphics	2+1	Major
EC-481	Wireless and Mobile Networks	3+0	Major
EC-482	Network Security and Cryptography	3+0	Major
EC-483	Fault Tolerant Computing	3+0	Major

Inter-Disciplinary Engineering Electives			
Code	**Course Title**	**C. H**	**Category**
CS-302	Artificial Intelligence	2+1	Inter-Disciplinary
CS-308	Software Quality Assurance	3+0	Inter-Disciplinary
CS-309	Web Application Engineering	2+1	Inter-Disciplinary
CS-406	Digital Image Processing	2+1	Inter-Disciplinary
CS-407	Fundamentals of Data Mining	2+1	Inter-Disciplinary
EE-304	Communication Systems	3+0	Inter-Disciplinary

Inter-Disciplinary Engineering Electives						
Area of Specialization	**Sr. No.**	**Course Code**	**Course Title**	**Credit Hours**	**Knowledge Area**	**Pre-requisite Courses (if any)**
Embedded Systems	1	EC-442	Embedded Systems	2+1	Major Based Core (Depth)	EC-333
	2	EC-444	Parallel and Distributed Computing	2+1	Major Based Core (Depth)	EC-228, EC-231
	3	EC-483	Fault Tolerant Computing	3+0	Major Based Core (Depth)	EC-222, EC-228
Artificial Intelligence	1	EC-448	Introduction to Robotics	2+1	Major Based Core (Depth)	EC-350
	2	CS-302	Artificial Intelligence	2+1	Inter-Disciplinary Engineering Breadth	MT-302, EC-222
	3	CS-406	Digital Image Processing	2+1	Inter-Disciplinary Engineering Breadth	EC-111
	4	CS-407	Fundamentals of Data Mining	2+1	Inter-Disciplinary Engineering Breadth	EC-334
Software Engineering	1	EC-465	Software Project Management	2+1	Major Based Core (Depth)	CS-204
	2	EC-467	Mobile Application Development	2+1	Major Based Core (Depth)	Nil
	3	CS-305	Computer Graphics	2+1	Inter-Disciplinary Engineering Breadth	EC-225
	4	CS-308	Software Quality	3+0	Inter-Disciplinary	CS-204

			Assurance		Engineering Breadth	
	5	CS-309	Web Design and Development	2+1	Inter-Disciplinary Engineering Breadth	EC-111
Networks	1	EC-445	System Programming	2+1	Major Based Core (Depth)	EC-231, EC-333
	2	EC-481	Wireless and Mobile Networks	3+0	Major Based Core (Depth)	EC-332
	3	EC-482	Network Security and Cryptography	3+0	Major Based Core (Depth)	EC-332

Mapping of Curriculum to PLOs

Sem. No.	Course Code	Course Title	Credit Hours	PLOs										
				1	2	3	4	5	6	7	8	9	10	11
1	BS-101	Engineering Physics	3+0	✓										
	HS-101	English	3+0									✓		
	MT-101	Calculus & Analytical Geometry	3+0	✓	✓	✓								
	EE-102	Electric Circuit Analysis	3+1	✓	✓						✓			
	HS-102	Pakistan Studies	2+0						✓					
	EC-110	Computing Fundamentals	2+1	✓		✓		✓						
	QT	Translation of the Quran: Beliefs	1+0 (NC)											
2	EE-101	Engineering Workshop	0+1	✓				✓			✓	✓		
	HS-103	Communication Skills	3+0									✓		
	EC-111	Programming Fundamentals	3+1	✓		✓		✓						
	EE-205	Electronic Devices and Circuits	3+1	✓										
	EC-225	Discrete Structures	3+0	✓	✓									
	MT-303	Applied Linear Algebra	2+0	✓	✓									
3	MT-103	Differential Equations	3+0	✓	✓									
	EC-121	Digital Logic Design	3+1	✓	✓	✓		✓			✓			
	HS-201	Technical Report Writing	3+0								✓	✓		

	IS-211	Islamic Studies	2+0						✓	✓				
	ME-211	Computer Aided Engineering Design	0+1	✓				✓						
	EC-230	Object Oriented Programming	3+1	✓	✓	✓		✓						
	QT-201	Translation of the Quran: Worships	1+0 (NC)											
4	MT-201	Complex Variables and Transforms	3+0	✓	✓									
	EC-201	Engineering Project Management	3+0						✓				✓	✓
	EC-222	Data Structures & Algorithms	3+1	✓	✓			✓						
	EC-223	Signals and Systems	3+1	✓	✓			✓						
	EC-228	Computer Architecture and Organization	3+1	✓	✓	✓		✓						
5	MT-202	Numerical Methods	2+1	✓	✓			✓						
	CS-204	Software Engineering	3+0	✓	✓	✓								
	EC-332	Computer Communication Networks	3+1	✓	✓			✓						
	EC-333	Microprocessor and Interfacing Techniques	3+1	✓		✓		✓			✓			
	EC-334	Database Systems	3+1	✓	✓	✓		✓						

	QT-301	Translation of the Quran: Moral Values	1+0 (NC)											
6	EC-231	Operating Systems	3+1	✓	✓			✓			✓			
	MT-302	Probability and Statistics	3+0	✓	✓									
	EC-341	Digital System Design	3+1		✓	✓	✓	✓			✓			
	EC-390	Digital Signal Processing	3+1	✓	✓	✓		✓			✓			
	xx-xxx	EC Depth Elective – I	2+1	Provided under List of Elective Courses.										
7	HS-401	Professional Values & Ethics	2+0						✓	✓				
	MS-403	Management and Entrepreneurship	3+0							✓	✓	✓		
	HS-404	Foreign Language	2+0									✓		✓
	xx-xxx	EC Depth Elective – II	2+1	Provided under List of Elective Courses.										
	xx-xxx	IDEE – I	2+1	Provided under List of IDEE Elective Courses.										
	EC-499	Final Year Project-I	0+3				✓	✓					✓	✓
	QT-401	Translation of the Quran: Dealing and Commandments	1+0 (NC)											
8	HS-402	Economics	2+0		✓								✓	✓
	HS-405	Health Safety and Environment	1+0						✓		✓			✓
	xx-xxx	EC Depth Elective – III	2+1	Provided under List of Elective Courses.										
	xx-xxx	EC Depth Elective – IV	2+1	Provided under List of Elective Courses.										

	xx-xxx	IDEE – II	2+1	Provided under List of IDEE Elective Courses.											
	EC-499	Final Year Project-II	0+6	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓
List of Elective Courses															
	EC-350	Control Engineering	3+1	✓		✓	✓	✓			✓			
	EC-442	Embedded Systems	2+1		✓	✓	✓	✓			✓			
	EC-444	Parallel and Distributed Computing	2+1	✓		✓	✓	✓			✓			
	EC-445	System Programming	2+1	✓		✓	✓	✓			✓			
	EC-448	Introduction to Robotics	2+1	✓	✓			✓			✓			
	EC-482	Network Security and Cryptography	3+0	✓	✓		✓							
	EC-316	Mobile Application Development	2+1	✓	✓	✓		✓			✓			
List of IDEE Elective Courses															
	CS-302	Artificial Intelligence	2+1	✓	✓			✓			✓			
	CS-406	Digital Image Processing	2+1	✓	✓			✓			✓			
	EE-304	Communication Systems	3+0	✓	✓	✓								
Total Count of each PLO				**35**	**25**	**16**	**7**	**24**	**6**	**3**	**16**	**5**	**2**	**5**

14.Curriculum with Learning Levels

Courses					Cognitive						Psychomotor						Affective					
		Course Code	**Course Title**	**PLO**	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**P1**	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**A1**	**A2**	**A3**	**A4**	**A5**
Ist Year	**Ist Semester**	BS-101	Engineering Physics	1		✓	✓															
		HS-101	English	10		✓	✓															
		MT-101	Calculus & Analytical Geometry	1,2,3	✓	✓	✓															
		EE-102	Electric Circuit Analysis	1,2		✓	✓	✓														
		EE-102L	Electric Circuit Analysis Lab	1,10								✓	✓						✓			
		HS-102	Pakistan Studies	6				✓	✓													
		EC-110	Computing Fundamentals	1,3	✓	✓																
		EC-110L	Computing Fundamentals Lab	5							✓	✓										
		QT-101	Translation of the Quran: Beliefs																			
	2nd Semester	EE-101L	Engineering Workshop Lab	1,5,9, 10								✓							✓	✓		
		HS-103	Communication Skills	10	✓				✓													
		EC-111	Programming Fundamentals	1,3		✓	✓															
		EC-111L	Programming Fundamentals Lab	5								✓			✓							
		EE-205	Electronic Devices and Circuits	1		✓	✓															
		EE-205L	Electronic Devices and Circuits Lab	1								✓										
		EC-225	Discrete Structures	1,2		✓	✓															
		MT-303	Applied Linear Algebra	1,2			✓	✓														
2nd Year	**3rd Semester**	MT-103	Differential Equations	1,2			✓															
		EC-121	Digital Logic Design	1,2,3		✓	✓	✓		✓												
		EC-121L	Digital Logic Design Lab	5,9								✓			✓							
		HS-201	Technical Report Writing	9,10		✓	✓												✓			
		IS-211	Islamic Studies	6,8	✓	✓																

		ME-211	Computer Aided Engineering Design	1,5	✓										✓						
		EC-230	Object Oriented Programming	1,2		✓	✓	✓													
		EC-230L	Object Oriented Programming Lab	3,5											✓						
		QT-201	Translation of the Quran: Worships																		
	4th Semester	MT-201	Complex Variables and Transforms	1,2			✓	✓													
		EC-201	Engineering Project Management	6,11, 12				✓		✓										✓	
		EC-222	Data Structures & Algorithms	1,2		✓															
		EC-222L	Data Structures & Algorithms Lab	5								✓									
		EC-223	Signals and Systems	1,2			✓	✓	✓												
		EC-223L	Signals and Systems Lab	5									✓								
		EC-228	Computer Architecture and Organization	1,2,3		✓		✓		✓											
		EC-228L	Computer Architecture and Organization Lab	5								✓	✓								
3rd Year	5th Semester	MT-202	Numerical Methods	1,2			✓								✓						
		MT-202L	Numerical Methods Lab	5								✓									
		CS-204	Software Engineering	1,2,3	✓			✓		✓											
		EC-332	Computer Communication Networks	1,2		✓		✓													
		EC-332L	Computer Communication Networks Lab	5									✓								
		EC-333	Microprocessor and Interfacing Techniques	1,3		✓				✓											
		EC-333L	Microprocessor and Interfacing Techniques Lab	5,9								✓	✓								
		EC-334	Database Systems	1,2,3	✓	✓	✓														
		EC-334L	Database Systems Lab	5										✓							
		QT-301	Translation of the Quran: Moral Values																		
	6th	EC-231	Operating Systems	1,2,3		✓	✓	✓		✓											

		EC-231L	Operating Systems Lab	5,9									✓		✓						
		MT-302	Probability and Statistics	1,2			✓														
		EC-341	Digital System Design	2,3,4			✓	✓		✓											
		EC-341L	Digital System Design Lab	5,9								✓	✓								
		EC-390	Digital Signal Processing	1,2,3		✓	✓	✓													
		EC-390L	Digital Signal Processing Lab	5,9								✓			✓						
		xx-xxx	EC Depth Elective – I																		
4th Year	**7th Semester**	HS-401	Professional Values & Ethics	6,7		✓	✓		✓												
		MS-403	Management and Entrepreneurship	7,8,9	✓		✓												✓		
		HS-404	Foreign Language	10, 12	✓	✓															
		xx-xxx	EC Depth Elective – II																		
		xx-xxx	IDEE – I																		
		EC-499	Final Year Project-I	4, 5, 11, 12		✓	✓								✓				✓		
		QT-401	Translation of the Quran: Dealing and Commandments																		
	8th Semester	HS-402	Economics	2,11, 12		✓			✓	✓											
		HS-405	Health Safety and Environment	6,8,11			✓	✓											✓		
		xx-xxx	EC Depth Elective – III																		
		xx-xxx	EC Depth Elective – IV																		
		xx-xxx	IDEE – II																		
		EC-499	Final Year Project-II	1,2,3,4,5,6,9,10,11,12																	

Curriculum Mapping CLO to PLO Mapping

1st Semester CLO to PLO Mapping:

EC-110 Computing Fundamentals 3 (2+1)			
CLO No	**CLO Description**	**Taxonomy Level**	**Assigned PLO**
1	**Define** the fundamentals of computer hardware, software and their usage.	**Cognitive Domain (Level C1)**	**PLO-1**
2	**Demonstrate** how to develop computer programs for real world engineering problems.	**Cognitive Domain (Level C3)**	**PLO-3**
3	**Identify** correct usage of Microsoft Office tools.	**Psychomotor Domain (Level P1)**	**PLO-5**
4	**Show** the code development and execution in C++ programming language.	**Psychomotor Domain (Level P2)**	**PLO-5**

HS-101- English 3 (3+0)

CLO No	CLO Description	Taxonomy Level	Assigned PLO
1	**Identify** common errors usually made by learners of English as second language	**Cognitive Domain (Level 2)**	PLO-9
2	**Use** English correctly using variety of modes in speaking and writing	**Cognitive Domain (Level 3)**	PLO-9

BS-101- Engineering Physics 3 (3+0)

CLO No	CLO Description	Taxonomy Level	Assigned PLO

1	**Compute** electric fields and forces for simple arrangements of static charges/charge distributions using electrostatic laws.	**Cognitive Domain (Level 3)**	PLO-1
2	**Apply** magneto statics laws to calculate magnetic forces and field strengths for steady currents.	**Cognitive Domain (Level 3)**	PLO-1
3	Differentiate between metals, semiconductors and insulators on the basis of band theory of solids.	**Cognitive Domain (Level 2)**	PLO-1

HS-102- Pakistan Studies 2(2+0)

CLO No	CLO Description	Taxonomy Level	Assigned PLO
1	**Describe** and explain the fundamental knowledge about creation of Pakistan and Muslim political struggle in Subcontinent. Analyze and compare the constitutional developments in Pakistan from 1947 to 1973.	**Cognitive Domain (Level 4)**	PLO-6
2	**Comprehend, discuss** and evaluate different geographical, political, economic, cultural and social problems of Pakistan at regional and international levels.	**Cognitive Domain (Level 5)**	PLO-6

MT-101 Calculus and Analytical Geometry 3(3+0)

CLO No	CLO Description	Taxonomy Level	Assigned PLO
1	**Describe** the functions and their behavior in plane and in space.	**Cognitive Domain (Level 1)**	PLO-1
2	**Ability** to find Maximas and Minimas of Mathematical functions describing physical quantities.	**Cognitive Domain (Level 2)**	PLO-2
3	**Ability** to calculate Definite integrals to find physical lengths, curves and volumes.	**Cognitive Domain (Level 3)**	PLO-3

EE – 102 Elecric Circuit Analysis 4(3+1)

CLO No	CLO Description	Taxonomy Level	Assigned PLO
1	Solve electric circuits using basic laws, methods of analysis and circuit theorems.	**Cognitive Domain (Level 3)**	PLO-1
2	Analyze transient analysis of RC and RL circuits.	**Cognitive Domain (Level 4)**	PLO-2
3	Understand and interpret basics of sinusoids, phasors, impedance and admittance of electric circuits.	**Cognitive Domain (Level 2)**	PLO-1
4	To perform experiments in laboratory to verify basic circuit laws, theorems and techniques involved in circuit theory by analyzing the experimental data.	**Psychomotor Domain (Level P2)**	PLO-1
5	To build lab project by applying knowledge gained during lab sessions.	**Psychomotor Domain (Level P3)**	PLO-1
6	To effectively present (verbally and in writing) the subject knowledge based on lab experiments and project assigned.	**Affective Domain (Level 2)**	PLO-9

2nd Semester CLO to PLO Mapping:

EC-225 Discrete Structures 3 (3+0)			
CLO No	**CLO Description**	**Taxonomy Level**	**Assigned PLO**
1	Ability to understand and demonstrate logic, basic structures and mathematical notations.	**Cognitive Domain (Level C2)**	**PLO-1**
2	Interpret basics of discrete probability and counting principle for problem solving.	**Cognitive Domain (Level C2)**	**PLO-2**
3	Utilize respective algorithmic thinking and apply them in problem solving.	**Cognitive Domain (Level C3)**	**PLO-2**
4	Ability to apply graph theory (trees) concepts.	**Cognitive Domain (Level C3)**	**PLO-2**
EE-205 Electronic Devices & Circuits 4 (3+1)			
CLO No	**CLO Description**	**Taxonomy Level**	**Assigned PLO**
1	Describe the basic knowledge in solid state electronics including diodes, BJTs, FETs and their applications.	**Cognitive Domain (Level C2)**	**PLO-1**
2	Express the working of different diode circuits using mathematical models and numerical analysis.	**Cognitive Domain (Level C2)**	**PLO-1**
3	Solve different BJT circuit configurations for multiple applications.	**Cognitive Domain (Level C3)**	**PLO-1**
4	Perform basic electronics experiments using lab equipment and components	**Psychomotor Domain (Level P2)**	**PLO-1**
EC-111 Programming Fundamentals 4 (3+1)			

CLO No	CLO Description	Taxonomy Level	Assigned PLO
1	Interpret a given program for all possible errors, rewrite the corrected code and generate the output.	**Cognitive Domain (Level C2)**	**PLO-1**
2	Apply the concepts of structural and basic programming constructs to write prototype codes	**Cognitive Domain (Level C3)**	**PLO-3**
3	Apply the file handling concepts to store and analyze the data in a file.	**Cognitive Domain (Level C3)**	**PLO-3**
4	Display the development of logical codes by applying the concepts of structural and basic programming constructs.	**Psychomotor Domain (Level P2)**	**PLO-5**
5	Construct a small project using the fundamentals of programming.	**Psychomotor Domain (Level P5)**	**PLO-5**
EE-101 ENGINEERING WORKSHOP 1 (0+1)			
CLO No	**CLO Description**	**Taxonomy Level**	**Assigned PLO**
1	Practice electric soldering, metal arc welding, filing and common circuits of single-phase electrical wiring	**Psychomotor Domain (Level P2)**	**PLO-1**
2	Practice basic learning of PCB Express/Express schematic.	**Psychomotor Domain (Level P2)**	**PLO-5**
3	To respond and present (verbally and in writing) the subject knowledge based on lab experiments and project.	**AffectiveDomain (Level A2)**	**PLO-9**
4	To performed assigned tasks in lab and project as an individual and to contribute a team effectively.	**AffectiveDomain (Level A3)**	**PLO-8**
MT-303 Applied Linear Algebra 2 (2+0)			
CLO No	**CLO Description**	**Taxonomy Level**	**Assigned PLO**

1	Solve system of linear equations with different algebraic techniques and its applications in engineering.	**Cognitive Domain (Level C4)**	**PLO-1**
2	Use of characteristic polynomial to compute the quadratic forms, eigenvalues, eigenvectors and solve eigenvalue problems in engineering applications.	**Cognitive Domain (Level C3)**	**PLO-2**

HS-201 Communication Skills 3(3+0)

CLO No	CLO Description	Taxonomy Level	Assigned PLO
1	Define and describe the basic concepts of communication and relate it to effective communication.	**Cognitive Domain (Level C1)**	**PLO-9**
2	Demonstrate the basic concepts of communication, select the relevant information, and summarize the written and spoken text	**Cognitive Domain (Level C5)**	**PLO-9**

3rd Semester CLO to PLO Mapping:

EC-230 Object Oriented Programming 4 (3+1)

CLO No	CLO Description	Taxonomy Level	Assigned PLO
1	**Describe** and demonstrate the basics of structures, OOP, objects and classes, operator overloading ,inheritance, polymorphism, virtual Functions and translation ofalgorithms to programs.	**Cognitive Domain (Level C2)**	**PLO-1**
2	**Apply** the concepts of structures, objects and classes, operator overloading , function overloading , a bstraction ,encapsulation ,inheritance ,polymorphism to createa medium-to-large scale	**Cognitive Domain (Level C3)**	**PLO-1**

	C++ programs for real world engineering problems		
3	**Analyze** and correct a given program for all possible errors and finally conclude the correct output.	**Cognitive Domain (Level C4)**	**PLO-2**
4	**Create** and implement logical code by implementing the concept of OOP using C++ IDE.	**Psychomotor Domain (Level P5)**	**PLO-5**
5	**Design** a small OOP based software system prototype.	**Psychomotor Domain (Level P5)**	**PLO-3**

EC-121: Digital Logic Design 4 (3+1)

CLO No	CLO Description	Taxonomy Level	Assigned PLO
1	**Explain, describe, discuss** and illustrate fundamental concepts of digital logic design including number systems, logic gates, and simplification methods of functions gates, basic components and functioning of combinational and sequential circuits .	Cognitive Domain (Level 2)	PLO-1
2	**Demonstrate**, employ and use the acquired knowledge to apply techniques related to the design and analysis of digital electronic circuits including Boolean algebra, multi-variable K-map methods, combinational and sequential design involving different types of circuits.	Cognitive Domain (Level 3)	PLO-1
3	**Devise**, draw, examine and analyze small-scale combinational logic and sequential digital circuits.	Cognitive Domain (Level 4)	PLO-2
4	**Design** and develop digital circuits for various applications in digital and logic design.	Cognitive Domain (Level 6)	PLO-3
5	**Perform** experiments in laboratory to implement combinational and sequential digital circuits. [Psychomotor 2]	Psychomotor Domain (Level 2)	PLO-5

6	**Work** in a team to construct lab project. [Psychomotor5]	Psychomotor Domain (Level 5)	PLO-8

ME-211: Computer Aided Engineering Design 1 (0+1)

CLO No	CLO Description	Taxonomy Level	Assigned PLO
1	**Describe** and Name the fundamentals of engineering drawing and graphics.	Cognitive Domain (Level 1)	PLO-1
2	**Read, Measure and Construct** the Orthographic projections in 1st and 3rd angle projection system.	Psychomotor Domain (Level 4)	PLO-5

IS-211: Islamic Studies 2 (2+0)

CLO No	CLO Description	Taxonomy Level	Assigned PLO
1	To understand Islamic beliefs and laws to apply Islamic principles on social And cultural issues [Cognitive, C1]	Cognitive Domain (C1)	PLO-6
2	To apply ethical views with understanding of Islamic parameters to their Professional and personal lives [Cognitive, C2]	Cognitive Domain (C2)	PLO-7

QT-201: Teaching of the holy Quran with translation (Worship) 1 (0+1)

CLO No	CLO Description	Taxonomy Level	Assigned PLO
1	-	Cognitive Domain (Level x)	PLO-1
2	-	Cognitive Domain (Level x)	PLO-2
3	-	Cognitive Domain (Level x)	PLO-3

4	-	Cognitive Domain (Level x)	PLO-5

MT-102- Differential Equations

CLO No	CLO Description	Taxonomy Level	Assigned PLO
1	Students will develop the capability to **Classify and apply** basic rules/techniques to **solve** various types of linear ordinary differential equations up to second order. (Cognitive, C3-Application)	(Cognitive, C3-Application)	PLO-1
2	Capability to develop, **solve** and **analyze** mathematical model for a given physical problem of practical engineering interest. (Cognitive, C3-Application)	(Cognitive, C3-Application)	PLO-1
3	To **solve** partial differential equations representing physical phenomena's such as heat flow and wave propagation. (Cognitive, C3-Application)	(Cognitive, C3-Application)	PLO-2

HS-201: Technical Report Writing 3 (3+0)

CLO No	CLO Description	Taxonomy Level	Assigned PLO
1	Demonstrate, orally and in writing, the understanding of the core concepts of technical report writing. (C2).	Cognitive Domain (Level 2)	PLO-9
2	Present technical report findings and conclusions orally, in individual/ group presentations. (A2)	Affective Domain (Level 2)	PLO-08
3	Compose and construct technical reports in various format and styles, for a variety of audiences. (C3)	Cognitive Domain (Level 3)	PLO-9

4th Semester CLO to PLO Mapping:

EC-201: Engineering Project Management 3 (3+0)			
CLO No	**CLO Description**	**Taxonomy Level**	**Assigned PLO**
1	Understand and Differentiate between the multiple managerial dynamics of a project/organization to deduce the key elements influencing the operatives..	**Cognitive Domain (Level C4)**	**PLO-6**
2	Develope the ability to identify problems and formulate sustainable solutions, leading towards efficient and effective project management practices.	**Cognitive Domain (Level C6)**	**PLO-10**
3	Research, develop and present managerial concerns of an ongoing project/ organization or an innovative idea.	**Affective Domain (Level 3)**	**PLO-11**
EC-222 Data Structures and Algorithms 4 (3+1)			
CLO No	**CLO Description**	**Taxonomy Level**	**Assigned PLO**
1	Illustrate fundamental static and dynamic data structures and relevant algorithms [Cognitive, C2]	**Cognitive Domain (Level C2)**	**PLO-1**
2	Demonstrate advantages and disadvantages of specific data structures w.r.t. expected running time and/or memory complexity [Cognitive, C2]	**Cognitive Domain (Level C2)**	**PLO-2**
3	Infer choice of data structure (graphs, trees etc.) for a program based on classification of basic operations [Cognitive, C2]	**Cognitive Domain (Level C2)**	**PLO-2**
4	Show solution for programming problems using data structures or improve existing code using learned algorithms and data structures [Psychomotor, P2]	**Psychomotor Domain (Level P2)**	**PLO-5**

MT-201: Complex Variable and Transform 3 (3+0)

CLO No	CLO Description	Taxonomy Level	Assigned PLO
1	Understand the concept of limit, continuity, differentiability of complex valued functions and Apply the results/theorems in complex analysis to complex valued functions.	**Cognitive Domain (Level C3)**	**PLO-1**
2	Understand the concept of Fourier series and integral transforms, e.g., Fourier, Laplace transforms through Partial fractions method, Tables, Convolution theorems and apply these transformations for engineering problems.	**Cognitive Domain (Level C4)**	**PLO-2**
3	Compute the gradients, directional derivatives and surface Integrals of functions and Apply Stokes ', Green's and Gauss Divergence theorems to compute line integrals along the boundary of a surface	**Cognitive Domain (Level C3)**	**PLO-1**

EE-228 Computer Architecture and Organization 4 (3+1)

CLO No	CLO Description	Taxonomy Level	Assigned PLO
1	Explain the structure and working principles associated in building off a digital computer and Understand various parts of system memory hierarchies	**Cognitive Domain (Level C2)**	**PLO-1**
2	Analyze mapping techniques for different cache memory systems.	**Cognitive Domain (Level C4)**	**PLO-2**
3	Design basic and intermediate RISC processor including instruction sets, data paths, microprogrammed control and ways of dealing with pipeline hazards.	**Cognitive Domain (Level C6)**	**PLO-3**

4	Perform by writing well-modularized computer programs in Verilog, implementing various parts of computer system.	**Psychomotor Domain (Level P2)**	**PLO-5**
4	Reproduce basic simulator and communicate findings on processor design.	**Psychomotor Domain (Level P3)**	**PLO-5**

EC-223 Signals and Systems 4(3+1)

CLO No	CLO Description	Taxonomy Level	Assigned PLO
1	COMPUTE the parameters of Continuous time signals and systems.	**Cognitive Domain (Level 3)**	**PLO-1**
2	ANALYZE properties and characterization of linear time invariant systems in time domain.	**Cognitive Domain (Level 4):**	**PLO-2**
3	ANALYZE Continuous time LTI systems in transform domains.	**Cognitive Domain (Level 5)**	**PLO-2**
4	To APPLY appropriate techniques using Python/MATLAB to complex engineering activities in experiments on signals and linear time invariant systems.	**Psychomotor Domain (Level 3)**	**PLO-5**

5th Semester CLO to PLO Mapping:

EC-334 Database Systems 4 (3+1)

CLO No	CLO Description	Taxonomy Level	Assigned PLO
1	**Define** the importance of databases, core concepts and terminologies related to relational database systems.	**Cognitive Domain (Level C1)**	**PLO-1**

2	**Design** Entity Relationship model based on stakeholders, their involvement & specific requirements; and vice versa.	**Cognitive Domain (Level C3)**	**PLO-3**
3	**Demonstrate** a moderate level of expertise in SQL and write queries to meet respective output.	**Cognitive Domain (Level C2)**	**PLO-1**
4	**Apply** normalization techniques to remove redundancy & achieve atomicity	**Cognitive Domain (Level C3)**	**PLO-2**
5	**Construct** database using modern database management system	**Psychomotor Domain (Level P4)**	**PLO-5**

EC-332 Computer Communication Networks 4(3+1)

CLO No	CLO Description	Taxonomy Level	Assigned PLO
1	**Understand** and **demonstrate** fundamental concepts of communication protocols and layered network.	**Cognitive Domain (Level C2)**	**PLO-1**
2	**Analyze** the requirements for a given organizational structure and select the most appropriate networking architecture and technologies.	**Cognitive Domain (Level C4)**	**PLO-2**
3	**Analyze** features, services and operations of various network, transport and application layer protocols of communication model.	**Cognitive Domain (Level C4)**	**PLO-2**
4	**Simulate** experiments related to networks using packet tracer.	**Psychomotor Domain (Level P3)**	**PLO-5**

MT-202 Numerical Methods 3(2+1)

CLO No	CLO Description	Taxonomy Level	Assigned PLO
1	**Use** of numerical techniques for solving linear and nonlinear equations	**Cognitive Domain (Level 3)**	PLO-1

2	To **construct** interpolating polynomials; differentiate and integrate given functions by numerical techniques.	**Cognitive Domain (Level 3)**	PLO-1
3	**Use** of numerical methods to **solve** ordinary differential equations (Initial–Value Problems).	**Cognitive Domain (Level 3)**	PLO-2
4	**Write** MATLAB codes of numerical techniques for solving linear/nonlinear equations, interpolating polynomials, differentiating and integrating given functions by using numerical techniques	**Psychomotor Domain (Level P2)**	PLO-5

EC-333 Microprocessor and Interfacing techniques 4(3+1)

CLO No	CLO Description	Taxonomy Level	Assigned PLO
1	**Develop** assembly programs containing arithmetic, logic, loop, and program control instructions	**Cognitive Domain (Level 3)**	PLO-1
2	**Design** decoding circuitry for interfacing memory and basic I/O devices with microprocessor.	**Cognitive Domain (Level 6)**	PLO-3
3	**Develop** C program to use micro-controller peripherals.	**Cognitive Domain (Level 3)**	PLO-1
4	**Design** a small micro-controller-based system prototype.	**Cognitive Domain (Level 6)**	PLO-3
5	**Perform** experiments in laboratory using development kits.	**Psychomotor Domain (Level P2)**	PLO-5
6	Work in a team to **simulate** laboratory project.	**Psychomotor Domain (Level P3)**	PLO-8

CS-204 Software Engineering 3(3+0)

CLO No	CLO Description	Taxonomy Level	Assigned PLO

1	Describe and apply the basic concepts of software engineering and workflow of software development process	**Cognitive Domain (Level 1)**	PLO-1
2	Analyze and solve small-scale engineering problems	**Cognitive Domain (Level 4)**	PLO-2
3	Design small software systems.	**Cognitive Domain (Level 6)**	PLO-3

6th Semester CLO to PLO Mapping:

EC-390 Digital Signal Processing 4(3+1)			
CLO No	**CLO Description**	**Taxonomy Level**	**Assigned PLO**
1	SOLVE Discrete Time systems to check their characteristics and response in time domain.	**Cognitive Domain (Level C2)**	**PLO-1**
2	ANALYZE discrete time signals & systems using transform domain techniques.	**Cognitive Domain (Level C3)**	**PLO-2**
3	DESIGN and formulate different digital filtering techniques.	**Cognitive Domain (Level C4)**	**PLO-3**
4	Perform signal processing and filtering experiments in digital domain using Python.	**Psychomotor Domain, (Level P2)**	**PLO-5**
5	Undertake lab projects to implement signal processing techniques.	**Psychomotor Domain, (Level P5)**	**PLO-8**
EC-231: Operating Systems 4 (3+1)			
CLO No	**CLO Description**	**Taxonomy Level**	**Assigned PLO**

1	Understanding of basic concepts of operating systems, Computer System and OS structures, management and coordination of processes, memory and storage management.	**Cognitive Domain (Level C2)**	**PLO-1**
2	Apply acquired knowledge, techniques and rules for solving problems or determining solutions in given situations in the areas of OS structures & activities, I/O operations, process scheduling and communication, synchronization problems and their handling, deadlocks, primary-memory and secondary-storage management strategies	**Cognitive Domain (Level C3)**	**PLO-1**
3	Carry out analysis, interpretation, differentiation and justification of different parts or components of OS pertaining to different types of operating systems, interrupts, process scheduling, OS design and process communication approaches, multithreading, CS problem solutions, primary memory management and disk-structure and management.	**Cognitive Domain (Level C4)**	**PLO-2**
4	Design, develop, create or plan a solution for memory protection, layered structure, system generation, CPU scheduler, threading model, Resolution of CS problem, handling of deadlocks, paging, segmentation, page-replacements and disk scheduling.	**Cognitive Domain (Level C6)**	**PLO-3**
5	Implement procedures and routines using Shell programming for management of user directories, disk space allocation, Linux based server, user accounts, windows server and CPU scheduling.	**Psychomotor Domain (Level P3)**	**PLO-8**
6	Construct/Sketch C/C++ program to implement OS design methodologies (e.g. scheduling algorithms, memory management techniques in Linux).	**Psychomotor Domain (Level P5)**	**PLO-5**
MT-302: Probability and Statistics 3(3+0)			
CLO No	**CLO Description**	**Taxonomy Level**	**Assigned PLO**
1	Comprehend the experimental data graphically as well as analytically.	**Cognitive Domain (Level C3)**	**PLO-1**

2	Recognize and formulate probability, conditional probability and probability distributions analytically and Infer hypotheses.	**Cognitive Domain (Level C3)**	**PLO-2**
3	Use the Central Limit Theorem to determine the behavior of mean values of various distributions and Infer hypotheses.	**Cognitive Domain (Level C3)**	**PLO-2**

EC-341: Digital System Design 4(3+1)

CLO No	CLO Description	Taxonomy Level	Assigned PLO
1	Demonstrate the ability understand specifications to design efficient building blocks, finite and Algorithmic state machines for digital system	**Cognitive Domain (Level C6)**	**PLO-2**
2	Apply coding styles to describe digital systems in Verilog HDL at various levels of abstractions	**Cognitive Domain (Level C3)**	**PLO-3**
3	Analyze digital designs for various issues such as glitches and hazards, issues pertaining to performance improvement or perform design space exploration	**Cognitive Domain (Level C4)**	**PLO-4**
4	Perform experiments in the laboratory to **simulate** various systems for functional verification and synthesize digital systems for FPGA implementation	**Psychomotor Domain (Level P3)**	**PLO-5**
5	Work in a team to build laboratory project and Demonstrate your work.	**Psychomotor Domain (Level P2) Affective Domain (Level A3)**	**PLO-8**

EC-344: Parallel and Distributed Computing 3(1+1)

CLO No	CLO Description	Taxonomy Level	Assigned PLO
1	Explain basic parallel and distributed systems terminology, classify parallel architectures, Illustrate memory hierarchy of various parallel and distributed systems	**Cognitive Domain (Level C2)**	**PLO-1**

2	Evaluate/compare/Determine/Estimate performance improvement before and after parallelization	**Cognitive Domain (Level C5)**	**PLO-3**
3	Create/Develop/Design parallel version of programs for shared memory and distributed memory systems	**Cognitive Domain (Level C6)**	**PLO-4**
4	Perform experiments in the laboratory	**Psychomotor Domain (Level P2)**	**PLO-5**
5	Work in a team to build laboratory project and Demonstrate your work	**Psychomotor Domain (Level P2) Affective Domain (Level A3)**	**PLO-8**

7th Semester CLO to PLO Mapping:

CS-406 Digital Image Processing 3 (2+1)

CLO No	CLO Description	Taxonomy Level	Assigned PLO
1	Describe and **demonstrate** the basic image processing concepts, its application and digital image representation.	**Cognitive Domain (Level C2)**	**PLO-1**
2	**Apply** the concept of image enhancement, image segmentation, morphological image processing and color image processing to solve given problem.	**Cognitive Domain (Level C3)**	**PLO-2**
3	**Analyze** a given image processing problem and finally propose a solution in form of algorithm of the problem.	**Cognitive Domain (Level C4)**	**PLO-2**
4	**Write** a code to implement concepts of digital image processing.	**Psychomotor Domain (Level P2)**	**PLO-5**
5	**Simulate** a small image processing project using the fundamentals of digital image processing.	**Psychomotor Domain (Level P3)**	**PLO-8**

EC-442 Embedded System 3 (2+1)

CLO No	CLO Description	Taxonomy Level	Assigned PLO
1	**Define** and **explain** different embedded system design technologies, explain the various metrics or challenges in designing an embedded system	**Cognitive Domain (Level C2)**	**PLO-2**
2	**Illustrate** how embedded processor, memory, periphral components and buses build an embedded system platform and their intraction	**Cognitive Domain (Level C3)**	**PLO-3**
3	**Evaluate** how architectural and implementation design decision influence performance and power dissipation in embedded system	**Cognitive Domain (Level C3)**	**PLO-4**
4	**Design** an embedded system prototype based on microcontroller or FPGA	**Cognitive Domain (Level C4)**	**PLO-3**
5	**Perform** experiments in laboratory using development kits	**Psychomotor Domain (Level P2)**	**PLO-5**
6	**Work in a team** to build laboratory project	**Psychomotor Domain (Level P3)**	**PLO-8**

HS-403 Management and Entrepreneurship 3 (3+0)

CLO No	CLO Description	Taxonomy Level	Assigned PLO
1	**Define, Describe** and **Apply** relevant theoretical concepts related to management and entrepreneurship for computer engineering students	**Cognitive Domain (Level C1)**	**PLO-6**

2	**Apply** acquired knowledge, techniques in the areas of Management and Entrepreneurship, examine and modify for handling problems	**Cognitive Domain (Level C3)**	**PLO-8**
3	**Interpret, discuss, present** and **compile** technical education related to business plan, writing business and feasibility plans in various formats and styles according to different industries in individual or group tasks	**Affective Domain (Level A2)**	**PLO-9**

HS- 401 Professional Values and Ethics 2 (2+0)

CLO No	CLO Description	Taxonomy Level	Assigned PLO
1	Define and **Explain** relevant theoretical concepts related to professional ethics in computer engineering.	**Cognitive Domain (Level C2)**	**PLO-7**
2	**Apply** the environmental ethics knowledge to **Identify** implications for different environmental issues	**Cognitive Domain (Level C3)**	**PLO-6**
3	**Explain & Justify** opinions on complex ethical scenarios. It's important for those confronted with ethical challenges to be able to hold multiple conflicting points of view, without necessarily adhering to any of them	**Cognitive Domain (Level C5)**	**PLO-7**

HS-404 Foreign Language

CLO No	CLO Description	Taxonomy Level	Assigned PLO
1	Theoretical and applied knowledge of linguistics and other social sciences subjects for studying and approaching issues involving languages. [Cognitive, C2]	**Cognitive Domain (Level C2)**	**PLO-9**
2	Theoretical and applied knowledge of undertaking empirical research leading to development. [Cognitive, C1]	**Cognitive Domain (Level C1)**	**PLO-11**

EC-467 Mobile Application Development

CLO No	CLO Description	Taxonomy Level	Assigned PLO
1	**Explain** different programming concepts used in the mobile applications development.	**Cognitive Domain (Level C2)**	**PLO-1**
2	**Apply** different programming techniques to develop the mobile applications functionality and interface.	**Cognitive Domain (Level C3)**	**PLO-3**
3	**Compare** and **analyze** different programming techniques used to develop mobile application that uses hardware and software resources like sensors and configuration.	**Cognitive Domain (Level C4)**	**PLO-2**
4	**Perform** experiments in laboratory using mobile application development environment.	**Psychomotor Domain (Level P2)**	**PLO-5**
5	**Reproduce** the task that was performed by the instructor and practice the programming techniques by performing the additional tasks.	**Psychomotor Domain (Level P3)**	**PLO-8**

HS-403 Management and Entrepreneurship

CLO No	CLO Description	Taxonomy Level	Assigned PLO
1	Define, Describe and Apply relevant theoretical concepts related to management and entrepreneurship for computer engineering students.	**Cognitive Domain (Level C1)**	**PLO-6**
2	Apply acquired knowledge, techniques in the areas of Management and Entrepreneurship, examine and modify for handling problems	**Cognitive Domain (Level C3)**	**PLO-8**
3	Interpret, discuss, present and compile technical education related to business plan, writing business and feasibility plans in various formats and styles according to different industries in individual or group tasks	**Affective Domain (Level A2)**	**PLO-9**

8th Semester CLO to PLO Mapping:

EC-445 System Programming 3(2+1)

CLO No	CLO Description	Taxonomy Level	Assigned PLO
1	**Explain** basics of system software, UNIX operating system structure, system calls. Illustrate concepts related to memory management, processes, threads, kernel, scheduling.	**Cognitive Domain (Level C2)**	**PLO-1**
2	**Apply** system software knowledge and techniques to utilize system calls to accomplish I/O, file manipulation, memory management, process control, threads, synchronization, device drivers.	**Cognitive Domain (Level C3)**	**PLO-3**
3	**Evaluate/recommend/decide/determine** scheduling policy, IPC technique, use of threads vs process for the given information regarding a system software and requirements at hand.	**Cognitive Domain (Level C5)**	**PLO-4**
4	**Perform** experiments in laboratory.	**Psychomotor Domain (Level P2)**	**PLO-5**
5	Work in a team to build laboratory project and **demonstrate** your work.	**Psychomotor Domain (Level P3), Affective Domain (Level A3)**	**PLO-8**

HS-402 –Economics 2(2+0)

CLO No	CLO Description	Taxonomy Level	Assigned PLO
1	**Compute** cost analysis, demand, supply, breakeven analysis of an engineering work and develop skills for cost benefit analysis of projects and running operations.	**Cognitive Domain (Level C5)**	**PLO-2**
2	**Analyze** different alternatives and generate a solution keeping in view of the profit maximization, cost reduction concepts for ongoing operations and projects.	**Cognitive Domain (Level C6)**	**PLO-10**
3	**Explain** the different economic principles applied in businesses, manufacturing, and service concerns.	**Cognitive Domain (Level C2)**	**PLO-11**

ME-407 Health Safety and Environment 1(1+0)

CLO No	CLO Description	Taxonomy Level	Assigned PLO
1	**Demonstrate** knowledge of Safety, Health and Environment.	**Cognitive Domain (Level C3)**	**PLO-6**
2	**Analyze** various types of hazards at work and living places	**Cognitive Domain (Level C4)**	**PLO-6**
3	**Demonstrate** willingness to work in a team to reduce / eliminate health and safety hazards.	**Affective Domain (Level A3)**	**PLO-8**
4	**Evaluate** risks of hazards in various scenarios and give suggestions to mitigate / eliminate them	**Cognitive Domain (Level C4)**	**PLO-11**

EE-482 Network Security and Cryptography 3(3+0)

CLO No	CLO Description	Taxonomy Level	Assigned PLO

1	**Understand** and describe fundamental concepts networks security, security architectures, network attacks and conventional cryptography techniques.	**Cognitive Domain (Level C2)**	**PLO-1**
2	**Demonstrate** the structure of modern cryptographic techniques and Apply them on the given plain text.	**Cognitive Domain (Level C3)**	**PLO-2**
3	**Analyze** the given scenario for possible cryptanalytic attacks and classify different techniques of message authentication.	**Cognitive Domain (Level C4)**	**PLO-4**

CS-302 Artificial Intelligence 3(2+1)

CLO No	CLO Description	Taxonomy Level	Assigned PLO
1	**Understanding** of basic concepts of artificial Intelligence, solving problems using various uninformed and informed search strategies.	**Cognitive Domain (Level C2)**	**PLO-1**
2	**Apply** acquired knowledge, techniques and rules for solving problems using AI techniques or determining solutions in given situations in the areas of AI.	**Cognitive Domain (Level C3)**	**PLO-1**
3	**Explain** machine learning systems, demonstrating and understanding of machine learning concepts.	**Cognitive Domain (Level C5)**	**PLO-2**
4	**Construct** logical code by implementing the concepts of Artificial Intelligence and Machine Learning using Python IDE/MATLAB.	**Psychomotor Domain (Level P4)**	**PLO-5**
5	**Construct** projects in the lab work that use Python/MATLAB for **studied** of the theoretical knowledge gained during class lectures, requiring some independent reading, programming and learning	**Psychomotor Domain (Level P5)+ Affective**	**PLO-8**

		Domain (Level A3)	

Courses with Learning Level in K-P-A Domains

	Cognitive Domain			Psychomotor Domain			Affective Domain		
	No. of Courses	**Maxi Level**	**Mini Level**	**No. of Courses**	**Maxi Level**	**Mini Level**	**No. of Courses**	**Maxi Level**	**Mini Level**
1st Semester	6	C5	C1	2	P2	P1	1	A2	A2
2nd Semester	5	C5	C1	3	P5	P2	1	A3	A2
3rd Semester	6	C6	C1	3	P5	P2	1	A2	A2
4th Semester	5	C6	C2	3	P3	P3	1	A3	A3
5th Semester	5	C6	C1	4	P4	P2	0	0	0
6th Semester	4	C6	C2	3	P5	P2	0	0	0
7th Semester	4	C5	C1	1	P3	P2	1	A2	A2
8th Semester	2	C6	C2	0	0	0	1	A3	A3
Internship	-	-	-	-	-	-	-	-	-
Community Services	-	-	-	-	-	-	-	-	-
Overall	40	C6	C1	19	P5	P1	6	A3	A2

15. Correlation Matrix PLOs-ECs-WKs-SDGs

PLOs		ECs	WKs	SDGs
PLO-1	Engineering Knowledge	EC-1 & EC-2	WK 1,2,3 & 4	SDG 9
PLO-2	Problem Analysis	EC-3	WK 1,2,3 & 4	SDG 1 TO 17
PLO-3	Design/Development of Solutions	EC-4	WK 5	SDG 1,2,3,6,9,10,11,12,13,14
PLO-4	Investigation	EC-5	WK 8	SDG 9
PLO-5	Tool Usage	EC-3 &EC-5	WK 2 & 6	SDG 9
PLO-6	The Engineer and the World	EC-6 &EC-7	WK 1,5 & 7	SDG 1 TO 17
PLO-7	Ethics	EC-8	WK 9	SDG 10,16
PLO-8	Individual and Collaborative Team Work	EC-10	WK 9	SDG 5,10,16
PLO-9	Communication	EC-10	WK 1 & 9	SDG 5,10,16
PLO-10	Project Management and Finance	EC-9	WK 2 & 5	SDG 9,10
PLO-11	Lifelong Learning	EC-11, EC-12 &EC-13	WK 8	SDG 3,4,8,9,12,13

**** Sample is available in appendix-I***

16. Complex Engineering Problem

Year	Semester	Course Code	Course Title
2nd	4th	EC-222	Data Structure and Algorithm
		EC-228	Computer Architecture and Organization
3rd	5th	EC-223	Signals and Systems
		EC-334	Database Systems
		EC-333	Microprocessor & Interfacing Techniques
		EC-332	Computer Communication Networks
	6th	EC-390	Digital Signal Processing
		EC-231	Operating Systems
		EC-341	Digital System Design
		XX-XXX	EC-Depth Elective-I
4th	7th	XX-XXX	EC-Depth Elective-II
		XX-XXX	IDEE-I
	8th	XX-XXX	EC-Depth Elective-III
		XX-XXX	EC-Depth Elective-IV
		XX-XXX	IDEE-II

**** Characteristics of CEP are available in appendix-II***

17. Open-Ended Lab

Year	Semester	Course Code	Course Title
2nd	3rd & 4th	EC-121L	Digital Logic Design Lab
		EC-222L	Data Structure and Algorithm Lab
3rd	5th	EC-332L	Computer Communication Networks
		EC-334L	Database Systems
		EC-333L	Microprocessor & Interfacing Techniques Lab
	6th	EC-390L	Digital Signal Processing

		EC-341L	Digital System Design
		EC-231L	Operating Systems
		XX-XXX	EC-Depth Elective-I
4th	7th	XX-XXX	EC-Depth Elective-II
		XX-XXX	IDEE-I
	8th	XX-XXX	EC-Depth Elective-III
		XX-XXX	EC-Depth Elective-IV
		XX-XXX	IDEE-II

18. Key Performance Indicators (KPIs)

		Evaluation Strategy	KPI		Frequency		Remarks
			KPI Indicator	KPI Target Value	Data Collection	Analysis	
PEO	Program Level	**Indirect**	Score of Employer Survey Form	At least 60% of the Survey Form responses must attain a score of 3 or above on a scale of 1 to 5.	Every Year	4 –Years From Graduation	PEO Attainment
			Score of Alumni Survey form	At least 60% of the graduates must be employed *(At least 10% of graduate students should go for higher studies.)* *(At least 10% of the graduate students should manage self-initiated business activities.)*			PEO Attainment
PLO	Student Level (Individual)	**Direct**	CLO scores of the student in the mapped course(s)	Each student must obtain at least 50% score in CLO to attain mapped PLO with it.	Every Semester	Every Semester	PLO Attainment
	Course Level (Cohort)	**Direct**	PLO scores of all the students in the mapped course	At least 50% of the students must attain relevant PLO	Every Semester	Every Semester	PLO Attainment
	Program Level	**Direct**	Final PLO attainment statistics of all the courses including FYDP	Each student must attain all PLOs in 50% of a total number of relevant courses.	At graduation	At graduation	PLO Attainment
		Indirect	Exit Survey Result	At least 50% of the Survey Form responses must attain a score of 3 or above on a scale of 1 to 5.			PLO Attainment

		Evaluation Strategy	KPI		Frequency		Remarks
			KPI Indicator	KPI Target Value	Data Collection	Analysis	
		Indirect	Internship Survey Result	At least 50% of the students' responses must attain a score of 3 or above on a scale of 1 to 5.			PLO Attainment
CLO	Student Level (Individual)	Direct	CLO score of the student	The student must obtain at least 50% score to attain relevant CLO.	Every Semester	Every Semester	CLO Attainment
	Course Level (Cohort)	Direct	CLO scores of all students in the course	At least 50% students in the course must attain relevant CLO	Every Semester	Every Semester	CLO Attainment

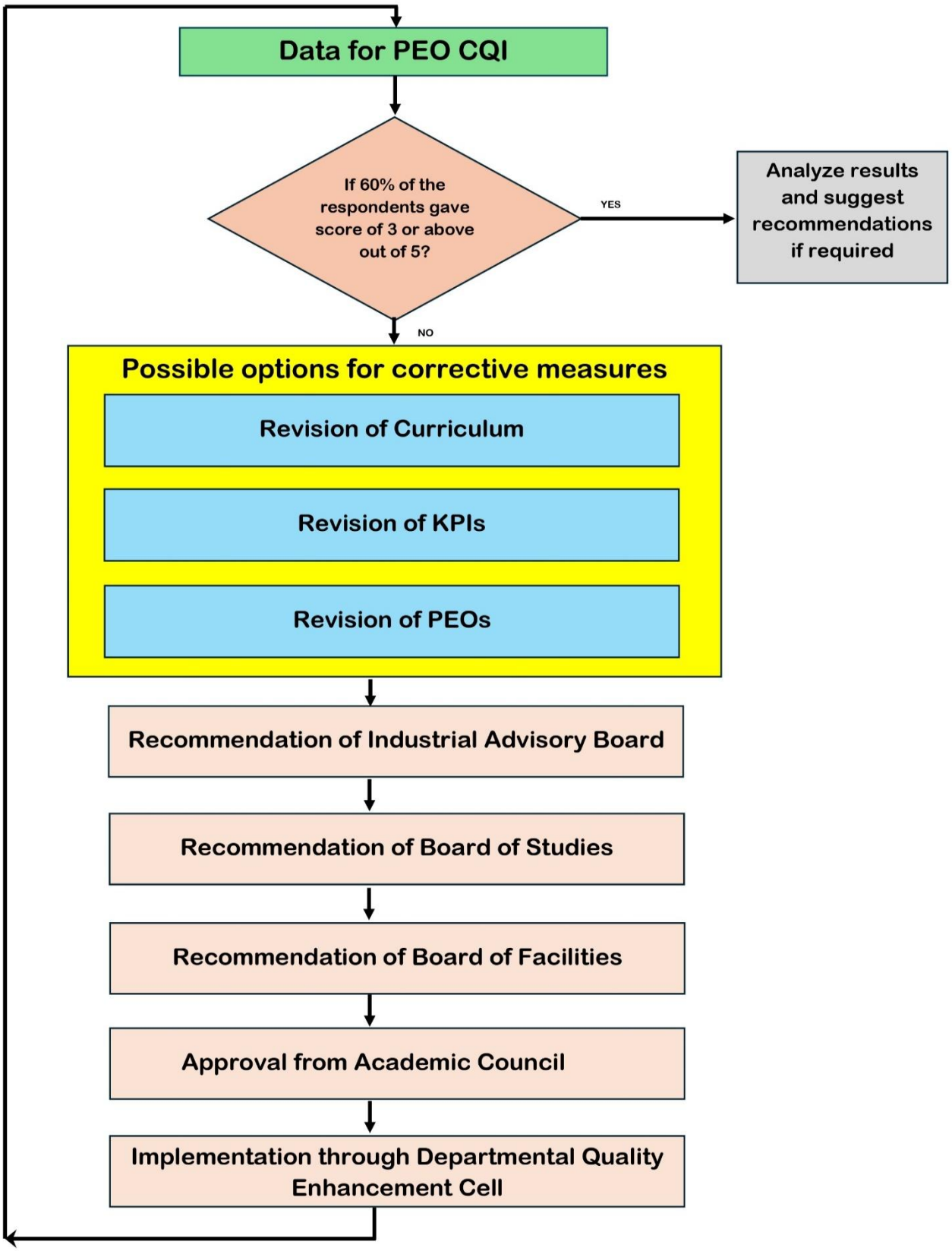
19. Continuous Quality Improvement (CQI)

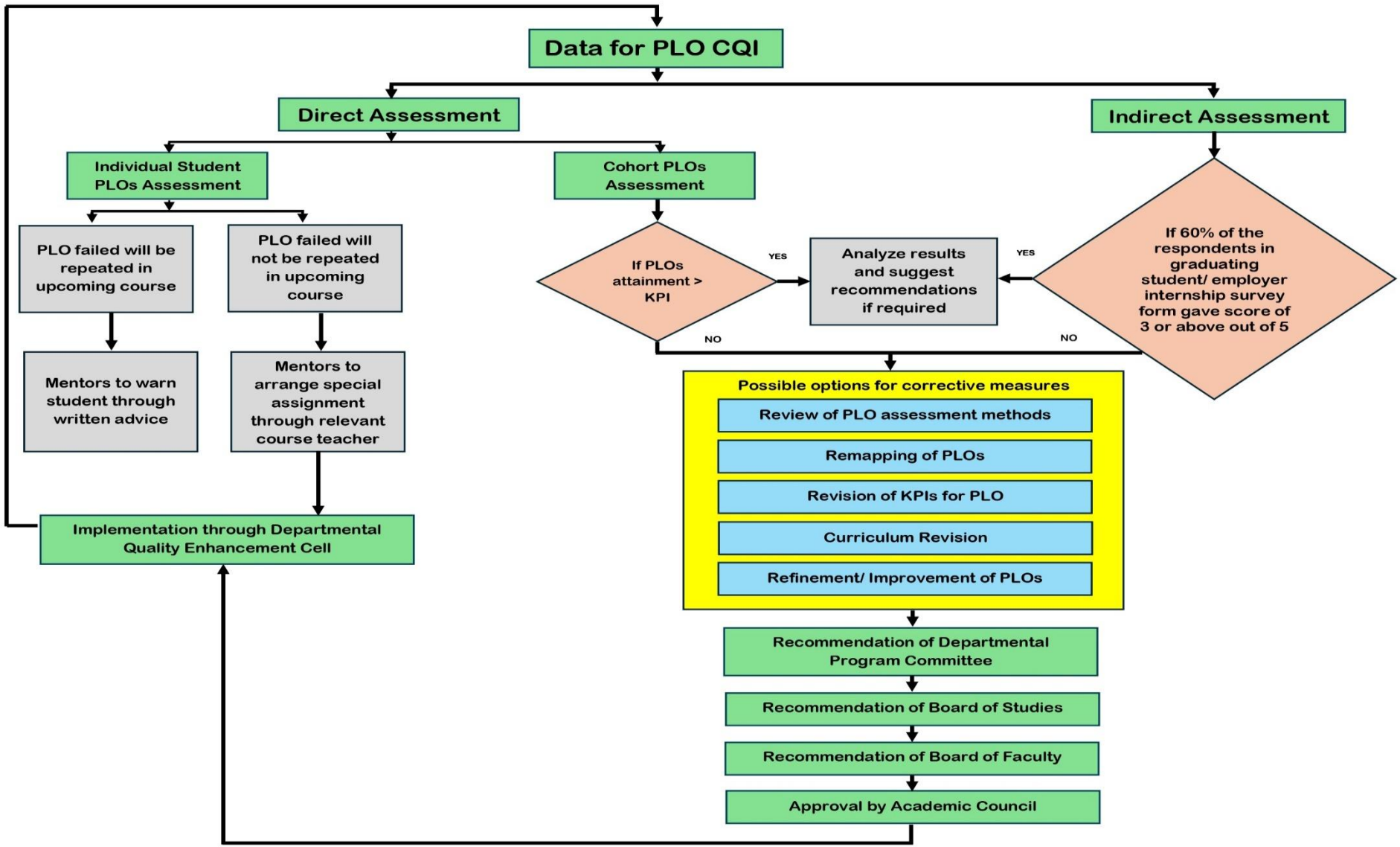
PEO CQI		
Program KPI		
KPI Achieved	Analyze the result and suggest recommendations if required.	
KPI Not Achieved	**Possible Options for Corrective Measure**	
	a.	Revision of Curriculum
	b.	Revision of KPIs
	c.	Revision of PEOs
	Implementation Steps for Corrective Measures	
	a.	Recommendation of Industrial Advisory Board
	b.	Recommendation of Board of Studies
	c.	Recommendation of Board of Faculty
	d.	Approval from Academic Council
	e.	Implementation through departmental quality enhancement cell (DQEC).

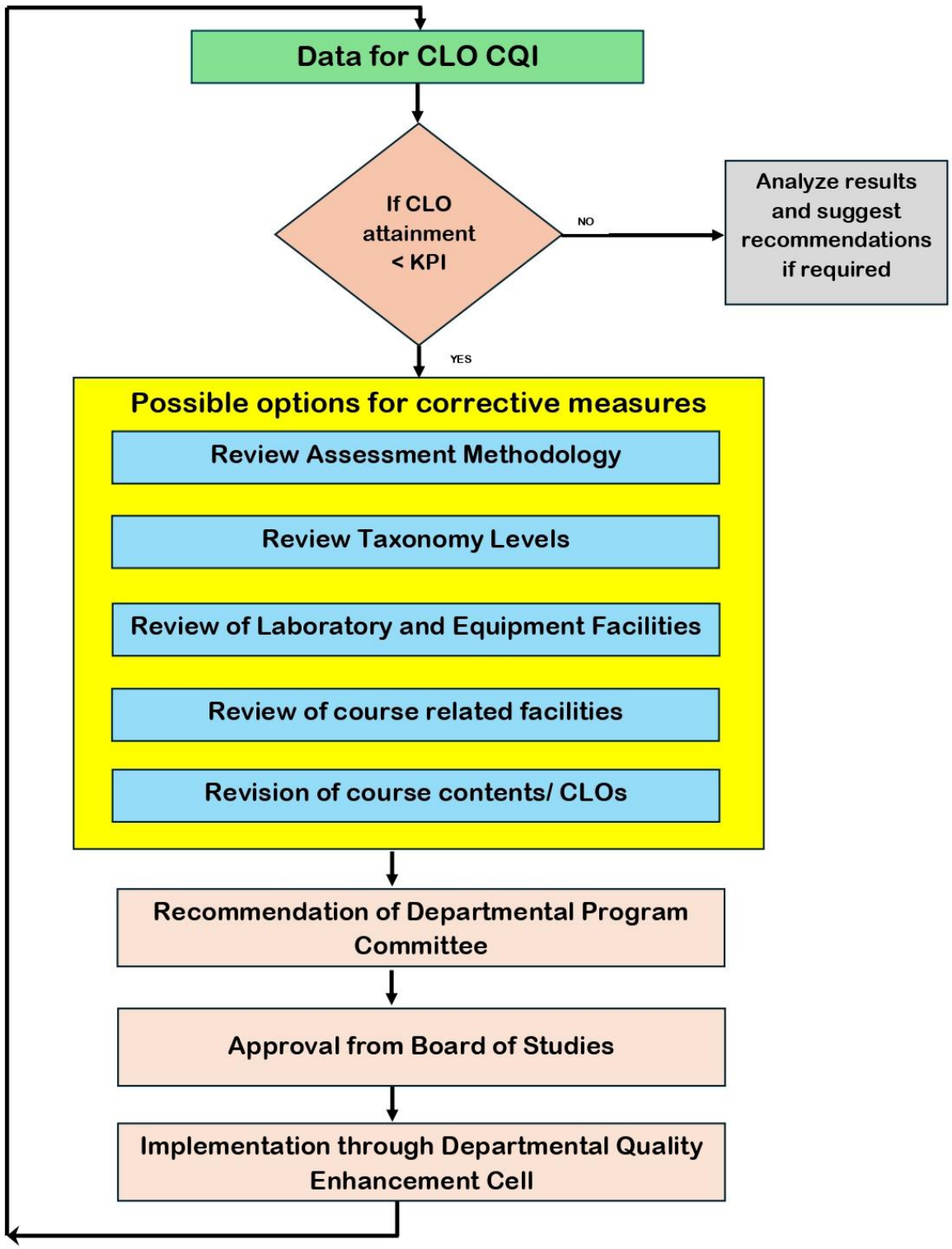
PLO CQI		
Program KPI		
KPI Achieved	Analyze the result and suggest recommendations if required.	
KPI Not Achieved	**Direct Assessment**	
	a.	**Individual student PLO assessment**
		i. If student fails and he/she is not in 8th semester then failed PLO shall be repeated in upcoming course and mentor shall issue warning letter to the student. ii. If student fails and he/she is in 8th semester then mentor shall arrange special assignments through the relevant course teacher and after evaluation the student shall declare pass/fail. The decision shall be implemented through departmental QEC.
	b.	**Assessment at Cohort Level**
		i. If PLOs attainment is greater than KPI then analyze the result and suggest recommendations if required. ii. Otherwise, possible corrective measures list below: a) Review of PLO assessment method. b) Remapping of PLOs. c) Revision of KPIs for PLO. d) Curriculum Revision. e) Refinement/ Improvement of PLOs. **Implementation Steps for Corrective Measures** a) Recommendation of Program Committee/ IAB. b) Recommendation of Board of Studies.

		c) Recommendation of Board of Faculty. d) Approval by the Academic Council. e) Implementation through departmental quality enhancement cell (DQEC).
	Indirect Assessment	
		i. If 60% of the responses in exit / internship survey gives score of 3 or above on a scale of 1 to 5 then analyze the results and give recommendations if required. ii. Otherwise, possible corrective measures list below: a) Review of PLO assessment method. b) Remapping of PLOs. c) Revision of KPIs for PLO. d) Curriculum Revision. e) Refinement/ Improvement of PLOs. **Implementation Steps for Corrective Measures** a) Recommendation of Program Committee/ IAB. b) Recommendation of Board of Studies. c) Recommendation of Board of Faculty. d) Approval by the Academic Council. e) Implementation through departmental quality enhancement cell (DQEC).

CLO CQI		
Program KPI		
KPI Achieved	Analyze the result and suggest recommendations if required.	
KPI Not Achieved	**Possible Options for Corrective Measure**	
	a.	Review Assessment Methodology
	b.	Review Taxonomy Levels
	c.	Review of Laboratory and Equipment Facilities
	d.	Review of course related facilities
	e.	Revision of course contents/ CLOs
	Implementation Steps for Corrective Measures	
	a.	Recommendation of Program Committee
	b.	Approval from Board of Studies
	c.	Implementation through departmental quality enhancement cell (DQEC).


Data for PEO CQI
If 60% of the respondents gave score of 3 or above out of 5?
YES
Analyze results and suggest recommendations if required
NO
Possible options for corrective measures
Revision of Curriculum
Revision of KPIs
Revision of PEOs
Recommendation of Industrial Advisory Board
Recommendation of Board of Studies
Recommendation of Board of Facilities
Approval from Academic Council
Implementation through Departmental Quality Enhancement Cell


Data for PLO CQI
Direct Assessment
Indirect Assessment
Individual Student PLOs Assessment
Cohort PLOs Assessment
PLO failed will be repeated in upcoming course
PLO failed will not be repeated in upcoming course
If PLOs attainment > KPI
YES
Analyze results and suggest recommendations if required
YES
If 60% of the respondents in graduating student/ employer internship survey form gave score of 3 or above out of 5
NO
NO
Mentors to warn student through written advice
Mentors to arrange special assignment through relevant course teacher
Possible options for corrective measures
Review of PLO assessment methods
Remapping of PLOs
Revision of KPIs for PLO
Curriculum Revision
Refinement/ Improvement of PLOs
Implementation through Departmental Quality Enhancement Cell
Recommendation of Departmental Program Committee
Recommendation of Board of Studies
Recommendation of Board of Faculty
Approval by Academic Council


Data for CLO CQI
If CLO attainment < KPI
NO
Analyze results and suggest recommendations if required
YES
Possible options for corrective measures
Review Assessment Methodology
Review Taxonomy Levels
Review of Laboratory and Equipment Facilities
Review of course related facilities
Revision of course contents/ CLOs
Recommendation of Departmental Program Committee
Approval from Board of Studies
Implementation through Departmental Quality Enhancement Cell

20. Appendix-I

PLOs	ECs *	WKs	SDGs (Proposed)
PLO-1 **Engineering Knowledge:** Breadth, depth and type of knowledge, both theoretical and practical	**EC-1** **Comprehend and apply universal knowledge,** & **EC-2** **Comprehend and apply local knowledge**	(WK-1, WK-2, WK-3 & WK-4) **WK-1** **Natural sciences and awareness of relevant social sciences** **WK-2** **Mathematics & computing** **WK-3** **Engineering fundamentals** **WK-4** **Engineering specialist knowledge**	SDG-9
PLO-2 **Problem Analysis:** Complexity of analysis	**EC-3** **Problem analysis**	(WK-1, WK-2, WK-3 & WK-4) **WK-1** **Natural sciences and awareness of relevant social sciences** **WK-2** **Mathematics & computing** **WK-3** **Engineering fundamentals** **WK-4** **Engineering specialist knowledge**	Selected SDGs from SDG - 1 to 17 (relevance as per curriculum)

21. Appendix-II

	Characteristic	A **Complex Computing Problem** is a computing problem having some or all of the following characteristics:
1	Range of conflicting requirements	Involves wide-ranging or conflicting technical, computing, and other issues
2	Depth of analysis required	Has no obvious solution, and requires conceptual thinking and innovative analysis to formulate suitable abstract models
3	Depth of knowledge required	A solution requires the use of in-depth computing or domain knowledge and an analytical approach that is based on well-founded principles
4	Familiarity of issues	Involves infrequently-encountered issues
5	Level of problem	Is outside problems encompassed by standards and standard practice for professional computing
6	Extent of stakeholder involvement and level of conflicting requirements	Involves diverse groups of stakeholders with widely varying needs
7	Consequences	Has significant consequences in a range of contexts
8	Interdependence	Is a high-level problem possibly including many component parts or sub-problems
9	Requirement identification	Identification of a requirement or the cause of a problem is ill defined or unknown