ABES ENGINEERING COLLEGE, GHAZIABAD

Department of Electronics and Communication Engineering

PROGRAM: Bachelor of Technology (B. TECH)

COURSE OUTCOMES (CO) Statements & CO-PO-PSO Mapping

(SESSION 2022-23)

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HOD

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1. **Vision and Mission Statement of College, along with Quality Policy**

2. **Vision and Mission Statement of the Department**

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Vision and Mission of the College

Vision

To take ABES Engineering College to such a level that, it is at par with the leading institutions of the world in providing leadership to the international education system and be amongst the top-rated institutions of the world by providing a transformative education to create leaders and innovators embedded in traditional Indian values.

Mission

1. To create an ambiance for healthy teaching-learning process.
2. To nurture the students and infuse in them-
    - A passion to excel professionally.
    - A spirit to be of utmost use to the industry, corporate sector and the society at large.
    - An intense desire to take challenging responsibilities and leadership roles.
    - A craving to be wholesome good human beings.
3. To develop an environment for creating new knowledge through research and by thriving to explore innovative ideas.

Quality Policy

To continuously thrive to provide a congenial and wholesome academic environment and a healthy culture for faculty, staff and students which would motivate teachers' full participation with passion and develop an intense desire in the students to acquire comprehensive education and hence become a useful and confident human resource for the industry and academia.

Vision and Mission
of
Department of Electronics & Communication Engineering

Vision

To contribute to India and the world through excellence in education and research in the field of Electronics & Communication Engineering and serve as valuable resource for the industry and the society at large.

Mission

To create an environment, which shall encourage the development of innovative professionals and researchers in the cutting-edge technologies of Electronics & Communication Engineering, in line with industry requirements and to impart professional ethics with positive attitude.

Programme Educational Objectives (PEOs)

PEO 1. To impart the students sound technical knowledge and skills in the core & related science & mathematics subjects of Electronics & Communication Engineering so that they graduate as professionally competent engineers, capable of applying & implementing the acquired skills.

PEO 2. To inculcate in students a desire to be innovative and passionate about excelling in the field of Electronics & Communication Engineering.

PEO 3. To develop managerial and soft skills so that they become confident and competent enough to take challenging responsibilities & leadership roles in the industry & corporate.

PEO 4. To equip them with solid foundation in ECE engineering so that they can pursue higher studies in the subject.

PEO 5. To groom the students to acquire professional ethics, moral values and devotion to duty so that they prove to be worthy citizen of India with international outlook.

Program Outcomes (POs)

PO1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. **Individual and teamwork:** Function effectively as an individual, and as a member or leader in diverse exams, and in multidisciplinary settings.

PO10. **Communication:** Communicate effectively 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.

PO11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. **Life-long learning:** 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.

Program Specific Outcomes (PSOs) relevant to the Course:

PSO1. An ability to design and analyze the concepts and applications in the field of communication/ networking, signal processing, embedded systems, and semiconductor technology.

PSO2. An ability to comprehend the technological advancements in the usage of modern design tools to analyze and design subsystems/processes for a variety of applications.

PSO3. An ability to learn the courses related to Microelectronics; Signal processing, Microcomputers, Embedded and Communication Systems to develop solutions to real world problems.

PSO4. An ability to communicate in both oral and written forms, the work already done and the future with necessary road maps, demonstrating the practice of professional ethics and the concerns for social and environmental impact.

4. Evaluation Scheme as received from University

B. TECH. ELECTRONICS AND COMMUNICATION ENGINEERING (SECOND YEAR)

S.No.	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical (P)	Credits
SEMESTER III						
1	KOE035	Basics Data Structure & Algorithms	3	1	0	4
2	KAS301	Technical Communication	2	1	0	3
3	KEC301	Electronic Devices	3	1	0	4
4	KEC302	Digital System Design	3	1	0	4
5	KEC303	Network Analysis and Synthesis	3	0	0	3
6	KEC351	Electronics Devices Lab	0	0	2	1
7	KEC352	Digital System Design Lab	0	0	2	1
8	KEC353	Network Analysis and Synthesis lab	0	0	2	1
9	KEC354	Mini Project or Internship Assessment	0	0	2	1
10	KNC302	Python Programming	2	0	0	NC
11	-	MOOCs (Essential for Hons. Degree)	-	-	-	
TOTAL SEMESTER CREDITS						**22**

**The Mini Project or internship (3-4 weeks) conducted during summer break after II semester and will be assessed during III semester.*

SEMESTER IV						
1	KAS402	Maths-IV	3	1	0	4
2	KVE401	Universal Human Values	3	0	0	3
3	KEC401	Communication Engineering	3	0	0	3
4	KEC402	Analog Circuits	3	1	0	4
5	KEC403	Signal System	3	1	0	4
6	KEC451	Communication Engineering Lab	0	0	2	1
7	KEC452	Analog Circuits Lab	0	0	2	1
8	KEC453	Signal System Lab	0	0	2	1
9	KNC401	Computer System Security	2	0	0	NC
10		MOOCs (Essential for Hons. Degree)	-	-	-	-
TOTAL SEMESTER CREDITS						**21**

LIST OF ENGINEERING SCIENCE COURSES						
1.	KOE031/041	Engineering Mechanics	3	1	0	4
2.	KOE032/042	Material Science	3	1	0	4
3.	KOE033/043	Energy Science & Engineering	3	1	0	4
4.	KOE034/044	Sensor & Instrumentation	3	1	0	4
5.	KOE035/045	Basics Data Structure & Algorithms	3	1	0	4
6.	KOE036/046	Introduction to Soft Computing	3	1	0	4
7.	KOE037/047	Analog Electronics Circuits	3	1	0	4
8.	KOE038/048	Electronics Engineering	3	1	0	4

B. TECH. ELECTRONICS AND COMMUNICATION ENGINEERING (THIRD YEAR)

S.No.	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical (P)	Credits
SEMESTER V						
1.	KEC-501	Integrated Circuits	3	1	0	4
2.	KEC-502	Microprocessor & Microcontroller	3	0	0	4
3.	KEC-503	Digital Signal Processing	3	0	0	4
4.	KEC-053	Department Elective-I VLSI Technology	3	0	0	3
5.	KEC-058	Departmental Elective Course-II Optical Communication	3	1	0	3
6.	KEC-551	Integrated Circuits Lab	0	0	2	1
7.	KEC-552	Microprocessor & Microcontroller Lab	0	0	2	1
8.	KEC-553	Digital Signal Processing Lab	0	0	2	1
9.	KEC-554	Mini Project/Internship	0	0	2	1
10.	KNC501	Constitution of India, Law and Engineering	2	0	0	NC
11.		MOOCs (Essential for Hons. Degree)				
TOTAL SEMESTER CREDITS					**22**	

**The Mini Project or Internship (4weeks) conducted during summer break after IV Semester and will be assessed during Vth Semester.

Departmental Elective Course- I	**Departmental Elective Course - II**
KEC-051 Computer Architecture and Organization	KEC-055 Electronics Switching
KEC-052 Industrial Electronics	KEC-056 Advance Semiconductor Device
KEC-053 VLSI Technology	KEC-057 Electronic Instrumentation and Measurements
KEC-054 Advance Digital Design using Verilog	KEC-058 Optical Communication

S.No.	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical (P)	Credits
SEMESTER VI						
1.	KEC-601	Digital Communication	3	1	0	4
2.	KEC-602	Control System	3	1	0	4
3.	KEC-603	Antenna and Wave Propagation	3	1	0	4
4.	KEC-063	Department Elective–III- Data Communication Networks	3	0	0	3
5.	KOE067	Open Elective-I- Basics of Data Base Management System	3	0	0	3
6.	KEC-651	Digital Communication Lab	0	0	2	1
7.	KEC-652	Control System Lab	0	0	2	1
8.	KEC-653	Elective Lab- CAD for Electronics Lab	0	0	2	1
9.	KNC602	Indian Tradition, Culture and Society	2	0	0	NC
10.		MOOCs (Essential for Hons. Degree)	-	-	-	-
TOTAL SEMESTER CREDITS						**21**

Departmental Elective Course - III	**Elective Lab Course**
KEC-061 Microcontroller & Embedded System KEC-062 Satellite Communication KEC-063 Data Communication Networks KEC-064 Analog Signal Processing	KEC-653A Measurement & Instrumentation Lab KEC-653B CAD for Electronics Lab KEC-653C Microcontroller & Embedded System Lab

LIST OF OPEN ELECTIVE COURSES -I

KOE061- REAL TIME SYSTEMS
KOE062 -EMBEDDED SYSTEM
KOE063 -INTRODUCTION TO MEMS
KOE064 -OBJECT ORIENTED PROGRAMMING
KOE065- COMPUTER BASED NUMERICAL TECHNIQUES
KOE066- GIS & REMOTE SENSING
KOE067 -BASICS OF DATA BASE MANAGEMENT SYSTEM
KOE068 -SOFTWARE PROJECT MANAGEMENT
KOE069 -UNDERSTANDING THE HUMAN BEING COMPREHENSIVELYHUMAN ASPIRATIONS AND ITS FULFILLMENT

B. TECH. ELECTRONICS AND COMMUNICATION ENGINEERING (FOURTH YEAR)

S. No	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical (P)	Credits
SEMESTER VII						
1.	KHU702	HSMC-1-Project Management & Entrepreneurship Development	3	0	0	3
2.	KEC-072	Department Elective –IV VLSI Design	3	0	0	3
3.	KEC-075	Department Elective –V Information Theory & Coding	3	0	0	3
4.	KEC-076	Department Elective –V Wireless & Mobile Communication	3	0	0	3
5.	KOE074	Open Elective-II Renewable Energy Resources	3	0	0	3
6.	KEC751B	VLSI Design Lab	0	0	2	1
8.	KEC-752	Mini Project or Internship Assessment	0	0	2	1
9.	KEC753	Project-I	0	0	8	4
TOTAL SEMESTER CREDITS						18

Department Elective - 3 1. KEC-071 Digital Image Processing 2. KEC-072 VLSI Design 3. KEC-073 Optical Network 4. KEC-074 Microwave & Radar Engineering	**Department Elective Course-V** 1. KEC-075 Information Theory & Coding 2. KEC-076 Wireless & Mobile Communication 3. KEC-077 Micro & Smart Systems 4. KEC-078 Speech Processing
Lab for Department Elective 1. KEC753A Digital Image Processing Lab 2. KEC753B VLSI Design Lab 3. KEC753C Optical System and Networking Lab 4. KEC753D Microwave & Radar Engineering Lab	**Open Elective-II** 1. KOE071 FILTER DESIGN 2. KOE072 BIOECONOMICS 3. KOE073 MACHINE LEARNING 4. KOE074 RENEWABLE ENERGY RESOURCES 5. KOE075 OPERATIONS RESEARCH

S. No	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical (P)	Credits
SEMESTER VIII						
1.	KHU801	HSMC-2-Rural Development: Administration and Planning	3	0	0	3
2.	KOE-081	Cloud Computing	3	0	0	3
3.	KOE-094	Open Elective –IV Digital and Social Media Marketing	3	0	0	3
4.	KEC-851	Project II	0	0	18	9
		MOOCs (Essential for Hons. Degree)	-	-	-	-
TOTAL SEMESTER CREDITS						18

Open Elective-III	**Open Elective-IV**
1. KOE-080 FUNDAMENTALS OF DRONE TECHNOLOGY 2. KOE-081 CLOUD COMPUTING 3. KOE-082 BIO MEDICAL SIGNAL PROCESSING 4. KOE-083 ENTREPRENEURSHIP DEVELOPMENT 5. KOE-084 INTRODUCTION TO SMART GRID 6. KOE-085 QUALITY MANAGEMENT 7. KOE-086 INDUSTRIAL OPTIMIZATION TECHNIQUES 8. KOE-087 VIROLOGY 9. KOE-088 NATURAL LANGUAGE PROCESSING 10. KOE-089 **HUMAN VALUES IN MADHYASTH	1. KOE-090 ELECTRIC VEHICLES 2. KOE-091 AUTOMATION AND ROBOTICS 3. KOE-092 COMPUTERIZED PROCESS CONTROL 4. KOE-093 DATA WAREHOUSING & DATA MINING 5. KOE-094 DIGITAL AND SOCIAL MEDIA MARKETING 6. KOE-095 MODELING OF FIELD-EFFECT NANO DEVICES 7. KOE-096 MODELLING AND SIMULATION OF DYNAMIC SYSTEMS 8. KOE-097 BIG DATA 9. KOE-098 **HUMAN VALUES IN BUDDHA AND JAIN

5. Course Outcome (CO) Statements, its mapping with POs and PSOs for Odd Sem

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CO-PO-PSO MAPPING

Ref: AICTE Examination Reforms (w.e.f. November, 2018) & Prof. Dr.) N.J.Rao, IISc Banglore, NPTEL, https://www.youtube.com/watch?v=28mjSlfKWic

NAME OF SUBJECT WITH SUBJECT CODE: Basics Data Structure and Algorithms [KOE 035]	**NAME(S) OF FACULTY INVOLVED:** Mr. Puneet Garg
SESSION: 2022-23	**YEAR / SEM:** II / III

Course Outcome No.	**Statements**	**Knowledge Level, KL**
CO1	Understand and analyze the time and space complexity of an algorithm	K4 [Analyze]
CO2	Understand and implement fundamental algorithms (including sorting algorithms, graph algorithms, and dynamic programming)	K3 [Apply]
CO3	Discuss various algorithm design techniques for developing algorithms	K2 [Understand]
CO4	Discuss various searching, sorting and graph traversal algorithms	K3 [Apply]
CO5	Understand operation on Queue , Priority Queue , D-Queue.	K2 [Understand]

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	2	3	1	1								3		3	3	
CO2	2	1	1	2								1		3		
CO3	2	3	1	2						1		3			3	
CO4	2		1	1										3		
CO5	2		1											3		
Average	2	2.33	1	1.5						1		2.33		3	3	

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NAME OF SUBJECT WITH SUBJECT CODE: Technical Communication (KAS-301)	**NAME(S) OF FACULTY INVOLVED:** Ms. Lata Singh, Ms. Kumari Shalini
SESSION: 2022-23	**YEAR / SEM:** II / III

Course Outcome No.	Statements	Knowledge Level, KL
CO1	Students will be enabled to understand the nature and objective of technical communication relevant for the workplace as engineers.	K2 (Understand)
CO2	Students will utilize the technical writing for the purposes of technical communication and its exposure in various dimensions.	K3 (Apply)
CO3	Students would imbibe inputs by presentation skills to enhance confidence in face of diverse audience.	K3 (Apply)
CO4	Technical communication skills will create a vast know-how of the application of the learning to promote their technical competence.	K4 (Analyze)
CO5	It would enable them to evaluate their efficacy as fluent & efficient communicators by learning the voice-dynamics.	K4 (Analyze)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1		2	2	2		3		2	3	3	3	3	3			2
CO2		2	3	3	1	3		3		3	3	3	3			2
CO3			1						1	3						2
CO4		2	2	3	3	3	3	3	3	3	3	3	3			2
CO5								3	3	3	2	1	3			2
Average		2	2	2.67	2	3	3	2.75	2.5	3	2.75	2.5	3			2

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NAME OF SUBJECT WITH SUBJECT CODE: Electronic Devices (KEC-301)	**NAME(S) OF FACULTY INVOLVED:** Dr. Ajay Suri/Dr. Raman Kapoor
SESSION: 2022-23	**YEAR / SEM:** II / III

Course Outcome No.	Statements	Knowledge Level, KL
CO1	Understand the principles of semiconductor devices.	K2 (Understand)
CO2	Interpret and utilize the mathematical models of semiconductor junctions.	K3 (Apply)
CO3	Explain carrier transport in semiconductors and design resistors.	K2 (Understand)
CO4	Utilize the mathematical models of MOS transistors for circuits and systems.	K3 (Apply)
CO5	Infer and describe various applications of special purpose diodes.	K2 (Understand)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2								3		2			3	3
CO2	3	2								3		2			3	3
CO3	3	2								3		2			3	3
CO4	3	2								3		2			3	3
CO5	3	2								3		2			3	3
Average	3	2								3		2			3	3

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NAME OF SUBJECT WITH SUBJECT CODE: Digital System Design (KEC-302)	**NAME(S) OF FACULTY INVOLVED:** Ms. Upasana Sharma
SESSION: 2022-23	**YEAR / SEM:** II / III

Course Outcome No.	Statements	Knowledge Level, KL
CO1	Design and analyze combinational logic circuits.	K3 (Apply)
CO2	Design and analyze modular combinational circuits with MUX / DEMUX, Decoder & Encoder	K3 (Apply)
CO3	Design & analyze synchronous sequential logic circuits	K3 (Apply)
CO4	Analyze various logic families.	K2 (Understand)
CO5	Design ADC and DAC and implement in amplifier, integrator, etc.	K3 (Apply)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	3	3	3	3					3	3	3	3	3
CO2	3	3	3	3	3	3	3					3	3	3	3	3
CO3	3	3	3	3	3	3	3					3	3	3	3	3
CO4	3	3	2	3	3	3	3					3	3	3	3	3
CO5	3	3	2	3	3	3	3					3	3	3	3	3
CO6																
Average	3	3	2.4	3	3	3	3					3	3	3	3	3

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NAME OF SUBJECT WITH SUBJECT CODE: Network Analysis & Synthesis (KEC-303)	**NAME(S) OF FACULTY INVOLVED:** Mr. Sanjeev Kumar Saini, Ms. Rakhi Kumari
SESSION: 2022-23	**YEAR / SEM:** II/ III

Course Outcome No.	**Statements**	**Knowledge Level, KL**
CO1	Understand basics electrical circuits with nodal and mesh analysis.	K3 (Apply)
CO2	Appreciate electrical network theorems.	K3 (Apply)
CO3	Apply Laplace transform for steady state and transient analysis.	K3 (Apply)
CO4	Determine different network functions.	K3 (Apply)
CO5	Explain the frequency domain techniques.	K3 (Apply)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	2			3							3	3	3	3	
CO2	3	3			3							3	3	3	3	
CO3	3	2			3							3	3		3	
CO4	3	3			3							3	3	3	3	
CO5	3	2	1		3							3	3	3	3	
Average	3	2.4	1		3							3	3	3	3	

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CO-PO-PSO MAPPING

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NAME OF SUBJECT WITH SUBJECT CODE: Electronic Devices Lab (KEC-351)	**NAME(S) OF FACULTY INVOLVED:** Dr. Ajay Suri, Dr. Raman Kapoor,
SESSION: 2022-23	**YEAR / SEM:** II / III

Course Outcome No.	**Statements**	**Knowledge Level, KL**
CO1	Understand working of basic electronics lab equipment.	K2 (Understand)
CO2	Clarify working of PN junction diode and its applications.	K3 (Apply)
CO3	Describe characteristics of Zener diode.	K3 (Apply)
CO4	Design a voltage regulator using Zener diode.	K3 (Apply)
CO5	Elaborate working of BJT, FET, MOSFET and apply the concept in designing of amplifiers.	K3 (Apply)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	2	1		3				3	3		3	3	3		
CO2	3	2	1		3				3	3		3	3	3		
CO3	3	2	1		3				3	3		3	3			
CO4	3	2	2		3				3	3		3	3	3		
CO5	3	2	1		3				3	3		3	3	3		
Average	3	2	1.2		3				3	3		3	3	2.4		

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NAME OF SUBJECT WITH SUBJECT CODE: Digital System Design Lab (KEC-352)	**NAME (S) OF FACULTY INVOLVED:** Ms. Upasana Sharma,
SESSION: 2022-23	**YEAR / SEM:** II / III

Course Outcome No.	**Statements**	**Knowledge Level, KL**
CO1	Design and analyze combinational logic circuits.	K3 (Apply)
CO2	Design & analyze modular combinational circuits with MUX/DEMUX, decoder, encoder.	K3 (Apply)
CO3	Design & analyze synchronous sequential logic circuits.	K3 (Apply)
CO4	Design & build mini project using digital ICs.	K6 (Create)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3	1	2	2							3	3	3	3	3
CO2	3	3	2	2	2	3						3	3	3	3	3
CO3	3	3	3	2	2	3						3	3	3	3	3
CO4	3	3	3	2	2	3						3	3	3	3	3
Average	3	3	2.25	2	2	3						3	3	3	3	3

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NAME OF SUBJECT WITH SUBJECT CODE: Network Analysis & Synthesis Lab (KEC-353)	**NAME(S) OF FACULTY INVOLVED:** Mr. Sanjeev Kumar Saini, Ms. Rakhi Kumari
SESSION: 2022-23	**YEAR / SEM:** II / III

Course Outcome No.	**Statements**	**Knowledge Level, KL**
CO1	Understand basics of electrical circuits with nodal and mesh analysis.	K3 (Apply)
CO2	Appreciate electrical network theorems.	K3 (Apply)
CO3	Analyze RLC circuits.	K4 (Analyze)
CO4	Determine the stability of an electrical circuit.	K3 (Apply)
CO5	Design network filters.	K3 (Apply)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	2	1	1	3	0	0	0	3	3	0	3	3	3	0	0
CO2	3	2	1	1	3	0	0	0	3	3	0	3	3	3	0	0
CO3	3	2	1	1	3	0	0	0	3	3	0	3	3	0	0	0
CO4	3	2	2	1	3	0	0	0	3	3	0	3	3	3	0	0
CO5	3	3	1	1	3	0	0	0	3	3	0	3	3	3	0	0
Average	3	2.2	1.2	1	3	0	0	0	3	3	0	3	3	2.4	0	0

ABES ENGINEERING COLLEGE, GHAZIABAD

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

CO-PO-PSO MAPPING

Ref: AICTE Examination Reforms (w.e.f. November, 2018) & Prof. Dr.) N.J.Rao, IISc Banglore, NPTEL, https://www.youtube.com/watch?v=28mjSlfKWic

NAME OF SUBJECT WITH SUBJECT CODE: Mini Project and Internship Lab (KEC-354)	**NAME(S) OF FACULTY INVOLVED:** Mr. Deepak Garg, Dr. Ajay Suri, Dr. Raman Kapoor, Ms. Rakhi Kumari
SESSION: 2022-23	**YEAR / SEM**: II / III

Course Outcome No.	Statements	Knowledge Level, KL
CO1	Understand the organogram of the industry and appreciate the skill enhancement	K5 (Understand)
CO2	Write an effective mini-project or internship report	K3 (Apply)
CO3	Deliver an effective presentation	K3 (Apply)
CO4	Inculcate non-plagiarism and teamwork ethics	K4 (Analyze)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	3		3	3	3	3		3	3	3	3	3
CO2	1	3	3	3	3			3	3	3		3	3	3	3	3
CO3	1	3	3	3	3			3	3	3		3	3	3	3	3
CO4	1	3	3	3	3			3	3	3		3	3	3	3	3
Average	1.5	3	3	3	3		3	3	3	3		3	3	3	3	3

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CO-PO-PSO MAPPING

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NAME OF SUBJECT WITH SUBJECT CODE: Mathematics IV (KAS 402)	**NAME(S) OF FACULTY INVOLVED:** Dr. Ashish Arora
SESSION: 2022-23	**YEAR / SEM:** II/ IV

Course Outcome No.	Statements	Knowledge Level, KL
CO1	Remember the concept of partial differential equation and to solve partial differential equations.	K3 (Apply)
CO2	Analyze the concept of partial differential equations to evaluate the problems concerned with partial differential equations.	K3 (Apply)
CO3	Understand the concept of correlation, moments, skewness and kurtosis and curve fitting.	K3 (Apply)
CO4	Remember the concept of probability to evaluate probability distributions.	K3 (Apply)
CO5	Apply the concept of hypothesis testing and statistical quality control to create control charts.	K3 (Apply)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	1	2	3	3				3		3	3	3	3	2
CO2	3	3	1	2	3	3				3		3	3	3	3	2
CO3	2	3	1	3	3	3				3		3	3	3	3	2
CO4	3	3	1	3	3	3				3		3	3	3	3	2
CO5	2	3	2	3	3	3				3		3	3	3	3	2
Average	2.6	3	1.2	2.6	3	3				3		3	3	3	3	2

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

CO-PO-PSO MAPPING

Ref: AICTE Examination Reforms (w.e.f. November, 2018) & Prof. Dr.) N.J.Rao, IISc Banglore, NPTEL, https://www.youtube.com/watch?v=28mjSlfKWic

NAME OF SUBJECT WITH SUBJECT CODE: Universal Human Values (KVE-401)	**NAME (S) OF FACULTY INVOLVED:** **Mr. Akhilesh Pandey**
SESSION: 2022-23	**YEAR / SEM:** II / IV

Course Outcome No.	Statements	Knowledge Level, KL
CO1	Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society.	K2 (Understand)
CO2	Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.	K3 (Apply)
CO3	Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society	K2 (Understand)
CO4	Understand the harmony in nature and existence and work out their mutually fulfilling participation in the nature.	K2 (Understand)
CO5	Distinguish between ethical and unethical practices and start working out the strategy to actualize a harmonious environment wherever they work.	K3 (Apply)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1												1				2
CO2									1							2
CO3									3							2
CO4							3									2
CO5						3	3	3			1	2				2
CO6																
Average						3	3	3				1.5				2

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CO-PO-PSO MAPPING

Ref: AICTE Examination Reforms (w.e.f. November, 2018) & Prof. Dr.) N.J.Rao, IISc Banglore, NPTEL, https://www.youtube.com/watch?v=28mjSlfKWic

NAME OF SUBJECT WITH SUBJECT CODE: Communication Engineering (KEC-401)	**NAME (S) OF FACULTY INVOLVED:** Dr. Ajay Suri, Mr. Deepak Garg
SESSION: 2022-23	**YEAR / SEM:** II / IV

Course Outcome No.	**Statements**	**Knowledge Level, KL**
CO1	Review of signals and system, Frequency domain representation of signals, Principles of Amplitude Modulation systems-DSB, SSB and VSB modulations.	K2 (Understand)
CO2	Angle modulation, Representation of FM and PM signals, Spectral characteristics of angle modulated systems.	K2 (Understand)
CO3	Review of probability and random processes, Gaussian and White noise characteristics, noise in amplitude modulation systems, pre-emphasis and de-emphasis system, threshold effect in angle modulated system.	K2 (Understand)
CO4	Pulse modulation, Sampling process, Pulse Amplitude and Pulse Code Modulation (PCM), Differential Pulse Code Modulation, Delta Modulation, Noise considerations in PCM, Time Division Multiplexing, Digital Multiplexers.	K3 (Apply)
CO5	Digital Modulation Schemes-Phase Shift Keying, Frequency Shift Keying, Quadrature Amplitude Modulation, Continuous Phase Modulation and Minimum Shift Keying.	K2 (Understand)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3	3	3	3			2		2		3		3	3	3
CO2	3	3	3	3	3			2		2		3		3	3	3
CO3	3	3	3	3	3			2		2		3		3	3	3
CO4	3	3	3	3	3			2		2		3		3	3	3
CO5	3	3	3	3	3			2		2		3		3	3	3
Average	3	3	3	3	3			2		2		3		3	3	3

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CO-PO-PSO MAPPING

Ref: AICTE Examination Reforms (w.e.f. November, 2018) & Prof. Dr.) N.J.Rao, IISc Banglore, NPTEL, https://www.youtube.com/watch?v=28mjSlfKWic

NAME OF SUBJECT WITH SUBJECT CODE: Analog Circuits (KEC-402)	**NAME (S) OF FACULTY INVOLVED:** Mr. Shailendra Bisariya
SESSION: 2022-23	**YEAR / SEM:** II / IV

Course Outcome No.	**Statements**	**Knowledge Level, KL**
CO1	Understand the characteristics and design of diodes and transistors-based circuits.	K2 (Understand)
CO2	Design and analysis of various voltage and power amplifier circuits.	K3 (Apply)
CO3	Design sinusoidal and non-sinusoidal oscillators.	K3 (Apply)
CO4	Describe the functioning of Current Mirror and differential amplifier circuits	K2 (Understand)
CO5	Illustrate OP-AMP and design OP-AMP based circuits. and its applications LPF, HPF, BPF, BSF.	K4 (Analyze)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3	2	2	2					3		3	3		3	3
CO2	3	3	2	1	2					3		3	3		3	3
CO3	3	3	2	2	2					3		3	3		3	3
CO4	3	3	2	1	2					3		3	3		3	3
CO5	3	3	2	2	2					3		3	3		3	3
CO6																
Average	3	3	2	1.6	2					3		3	3		3	3

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CO-PO-PSO MAPPING

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NAME OF SUBJECT WITH SUBJECT CODE: Signal & System Lab (KEC-403)	**NAME(S) OF FACULTY INVOLVED:** Ms. Rakhi Kumari
SESSION:2022-2023	**YEAR / SEM:** II / IV

Course Outcome No.	**Statements**	**Knowledge Level, KL**
CO1	Analyze different types of signals	K3 (Apply)
CO2	Characterize linear shift-invariant (LSI) systems	K3 (Apply)
CO3	Represent continuous and discrete systems in time and frequency domain using Fourier series and transform.	K3 (Apply)
CO4	Diagnose discrete time signals in z-domain.	K3 (Apply)
CO5	Study sampling and reconstruction of a signal.	K2 (Understand)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	1										3	3	3	3	
CO2	3	2		1								3	3	3	3	
CO3	2	3	1	1	3							3	3	3	3	
CO4	2	3	1	1	3							3	3	3	3	
CO5	3	2	1	2	3							3	3	3	3	
Average	2.6	2.2	1	1.25	3							3	3	3	3	

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CO-PO-PSO MAPPING

Ref: AICTE Examination Reforms (w.e.f. November, 2018) & Prof. Dr.) N.J.Rao, IISc Banglore, NPTEL, https://www.youtube.com/watch?v=28mjSlfKWic

NAME OF SUBJECT WITH SUBJECT CODE: Communication Engineering Lab (KEC-451)	**NAME(S) OF FACULTY INVOLVED:** Dr. Ajay Suri, Mr. Deepak Garg
SESSION: 2022-23	**YEAR / SEM:** II / IV

Course Outcome No.	Statements	Knowledge Level, KL
CO1	Analyze and compare different analog modulation schemes for their modulation factor and power.	K2 (Understand)
CO2	Study pulse amplitude modulation.	K2 (Understand)
CO3	Characterize different digital modulation schemes and can compute the bit error performance.	K2 (Understand)
CO4	Define and simulate the Phase shift keying.	K4 (Analyze)
CO5	Design a front end BPSK modulator and demodulator.	K4 (Analyze)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	1	3	3				3	3		3	3	3	3	2
CO2	3	3	2	3	3				3	3		3	3	3	3	2
CO3	3	3	1	3	3				3	3		3	3	3	3	2
CO4	3	3	2	3	3				3	3		3	3	3	3	2
CO5	3	3	2	3	3				3	3		3	3	3	3	2
CO6																
Average	3	3	1.6	3	3				3	3		3	3	3	3	2

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CO-PO-PSO MAPPING

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NAME OF SUBJECT WITH SUBJECT CODE: Analog circuit Lab (KEC-452)	**NAME (S) OF FACULTY INVOLVED:** Dr. Manish Zadoo, Ms. Shilpa Srivastava
SESSION:2022-23	**YEAR / SEM:** II / IV

Course Outcome No.	**Statements**	**Knowledge Level, KL**
CO1	Describe the characteristics of transistors.	K2 (Understand)
CO2	Practically demonstrate various configurations of amplifier circuits.	K4 (Analyze)
CO3	Demonstrate the performance for sinusoidal and non- sinusoidal oscillators.	K3 (Apply)
CO4	Perform measurement and study of functioning of op-amp and design op-amp based circuits.	K3 (Apply)
CO5	Interpret the basics of ADC and DAC	K3 (Apply)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3	2	3	3				3	3		1	3	3	3	3
CO2	3	3	2	3	3				3	3		1	3	3	3	3
CO3	3	3	2	3	3				3	3		1	3	3	3	3
CO4	3	3	2	3	3				3	3		1	3	3	3	3
CO5	3	3	2	3	3				3	3		1	3	3	3	3
Average	3	3	2	3	3				3	3		1	3	3	3	3

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CO-PO-PSO MAPPING

Ref: AICTE Examination Reforms (w.e.f. November, 2018) & Prof. Dr.) N.J.Rao, IISc Banglore, NPTEL, https://www.youtube.com/watch?v=28mjSlfKWic

NAME OF SUBJECT WITH SUBJECT CODE: Signal System Lab (KEC-453)	**NAME(S) OF FACULTY INVOLVED:** Ms. Ritu Aggarwal, Ms. Geetanjali Raj
SESSION: 2022-23	**YEAR / SEM:** II / IV

Course Outcome No.	**Statements**	**Knowledge Level, KL**
CO1	Understand the basics operation of MATLAB.	K2 (Understand)
CO2	Analyze the time domain and frequency domain signals.	K4 (Analyze)
CO3	Implement the concept of Fourier series and Fourier transforms.	K3 (Apply)
CO4	Find the stability of system using pole-zero diagrams and bode diagram.	K3 (Apply)
CO5	Design frequency response of the system.	K4 (Analyze)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3	2	3	3				3	3		3	3	3	3	2
CO2	3	3	2	3	3				3	3		3	3	3	3	2
CO3	3	3	2	3	3				3	3		3	3	3	3	2
CO4	3	3	2	3	3				3	3		3	3	3	3	2
CO5	3	3	3	3	3				3	3		3	3	3	3	2
Average	3	3	2.2	3	3				3	3		3	3	3	3	2

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CO-PO-PSO MAPPING

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NAME OF SUBJECT WITH SUBJECT CODE: Integrated Circuits (KEC-501])	**NAME (S) OF FACULTY INVOLVED:** Dr. Manish Zadoo; Mr. Deepak Garg, Dr. Himani Garg
SESSION: 2022-23	**YEAR / SEM:** III / V

Course Outcome No.	**Statements**	**Knowledge Level, KL**
CO1	Explain complete internal analysis of op-amp 741-ic	K2 (Understand)
CO2	Examine and design op-amp based circuits and basic components of ics such as various types of filter.	K3 (Apply)
CO3	Implement the concept of op-amp to design op-amp based non-linear applications and wave-shaping circuits.	K3 (Apply)
CO4	Analyse and design basic digital ic circuits using CMOS technology.	K3 (Apply)
CO5	Describe the functioning of application specific ics such as 555Timer, VCO IC 566 and PLL.	K2 (Understand)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3	2	1	2							3	3	3	3	3
CO2	3	3	3	2	2	3						3	3	3	3	3
CO3	3	3	3	1	2							3	3	3	3	3
CO4	3	3	3	2	2							3	3	3	3	3
CO5	2	3	3		2	3						3	3	3	3	3
CO6																
Average	2.8	2.8	2.8	1.5	2	3						3	3	3	3	3

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CO-PO-PSO MAPPING

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NAME OF SUBJECT WITH SUBJECT CODE: MICROPROCESSOR & MICROCONTROLLERS (KEC502)	**NAME (S) OF FACULTY INVOLVED:** Ms. Ranjeeta Yadav , Ms. Tania Gupta, Mr. Rajeev Pandey
SESSION: 2022-23	**YEAR / SEM:** III / V

Course Outcome No.	**Statements**	**Knowledge Level, KL**
CO1	Demonstrate the basic architecture of 8085.	K2 (Understand)
CO2	Illustrate the programming model of microprocessors & write program using 8085 microprocessor.	K3 (Apply)
CO3	Interpret the basics of 8086 Microprocessor and interface different external Peripheral Devices like timer, USART etc. with Microprocessor (8085/8086).	K2 (Understand)
CO4	Compare Microprocessors & Microcontrollers, and comprehend the architecture of 8051 microcontroller	K3 (Apply)
CO5	Outline the programming model of 8051 and implement them to design projects on real time problems.	K4 (Analyze)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	2	3			3							3	3	3	3	
CO2	2	3	1	2	3							3	3	3	3	
CO3	2	3	1	2	3							3	3	3	3	
CO4	2	3		2	3							3	3	3	3	
CO5	2	3	2	2	3							3	3	3	3	
Average	2	3	1.33	2	3							3	3	3	3	

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CO-PO-PSO MAPPING Ref: AICTE Examination Reforms (w.e.f. November, 2018) & Prof. Dr.) N.J.Rao, IISc Banglore, NPTEL, https://www.youtube.com/watch?v=28mjSlfKWic	
NAME OF SUBJECT WITH SUBJECT CODE: Digital Signal Processing (KEC-503)	**NAME(S) OF FACULTY INVOLVED:** Dr. Devvrat Tyagi, Dr. MangalDeep Gupta
SESSION: 2022-23	**YEAR / SEM:** III/ V

Course Outcome No.	Statements	Knowledge Level, KL
CO1	Design and describe different types of realizations of digital systems (IIR and FIR) and their utilities.	K3 (Apply)
CO2	Select design parameters of analog IIR digital filters (Butterworth and Chebyshev filters) and implement various methods such as impulse invariant transformation and bilinear transformation of conversion of analog to digital filters.	K4 (Analyze)
CO3	Design FIR filter using various types of window functions.	K4 (Analyze)
CO4	Define the principle of discrete Fourier transform & its various properties and concept of circular and linear convolution. Also, students will be able to define and implement FFT i.e. a fast computation method of DFT.	K4 (Analyze)
CO5	Define the concept of decimation and interpolation. Also, they will be able to implement it in various practical applications.	K4 (Analyze)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1		1									3	3		
CO2	3	1	1	1									3	3		
CO3	3	1	1	1									3			
CO4	3	1		1									3	3		
CO5	3	1	1	1									3	3		
Average	2.8	1	1	1									3	3		

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CO-PO-PSO MAPPING

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NAME OF SUBJECT WITH SUBJECT CODE: VLSI Technology (KEC-053)	**NAME (S) OF FACULTY INVOLVED:** Mr. Shailendra Bisariya & Ms. Khushbu Bansal
SESSION: 2022-23	**YEAR / SEM:** III/ V

Course Outcome No.	**Statements**	**Knowledge Level, KL**
CO1	Interpret the basics of crystal growth, wafer preparation and wafer cleaning.	K2 (Understand)
CO2	Evaluate the process of Epitaxy and oxidation.	K3 (Apply)
CO3	Differentiate the lithography, etching and deposition process.	K2 (Understand)
CO4	Analyze the process of diffusion and ion implantation.	K3 (Apply)
CO5	Express the basic process involved in metallization and packaging.	K2 (Understand)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	2	2	1	1	3	0	2	0	0	0	0	3	3	3	3	0
CO2	2	3	1	2	1	0	0	0	0	0	0	3	3	3	3	0
CO3	2	2	1	2	3	0	0	0	0	0	0	3	3	3	3	0
CO4	2	3	1	1	1	0	0	0	0	0	0	3	3	3	3	0
CO5	2	2	2	2	1	0	0	0	0	0	0	3	3	3	3	0
Average	2	2.4	1.2	1.6	1.8	0	0.4	0	0	0	0	3	3	3	3	0

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CO-PO-PSO MAPPING

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NAME OF SUBJECT WITH SUBJECT CODE: Optical Communication (KEC-058)	**NAME(S) OF FACULTY INVOLVED:** Dr. Priyanka Bhardwaj, Dr. ManiDipa Roy, Ms. Geetanjali Raj
SESSION:2022-2023	**YEAR / SEM:** III/V

Course Outcome No.	**Statements**	**Knowledge Level, KL**
CO1	Define and explain the basic concepts and theory of optical communication.	K2 (Understand)
CO2	Describe the signal losses with their computation and dispersion mechanism occurring inside the optical fiber cable.	K3 (Apply)
CO3	Differentiate the optical sources used in optical communication with their comparative study.	K3 (Apply)
CO4	Identify different optical components on receiver side; assemble them to solve real world problems related to optical communication systems.	K3 (Apply)
CO5	Evaluate the performance of an optical receiver to get idea about power budget and ultimately be an engineer with adequate knowledge in optical domain.	K4 (Analyze)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	2	1	2	3							3	3	3	3	2
CO2	3	2	1	2	3							3	3	3	3	2
CO3	3	2		1	3							3	3	3	3	2
CO4	3	1	1	3	3							3	3	3	3	2
CO5	3	1	2	2	3	3	3					3	3	3	3	2
Average	3	1.6	1.25	2	3	3	3					3	3	3	3	2

ABES ENGINEERING COLLEGE, GHAZIABAD

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

CO-PO-PSO MAPPING

Ref: AICTE Examination Reforms (w.e.f. November, 2018) & Prof. Dr.) N.J.Rao, IISc Banglore, NPTEL, https://www.youtube.com/watch?v=28mjSlfKWic

NAME OF SUBJECT WITH SUBJECT CODE: Integrated Circuit Lab (KEC-551)	**NAME(S) OF FACULTY INVOLVED:** Mr. Deepak Garg, Dr. Manish Sharma
SESSION: 2022-23	**YEAR / SEM:** III / V

Course Outcome No.	**Statements**	**Knowledge Level, KL**
CO1	Analyze the parameters and design respective Amplifiers and comparators.	K4 (Analyze)
CO2	Examine and implement the linear and non-linear applications of operational amplifiers.	K4 (Analyze)
CO3	Explore different applications of converters and timer IC.	K4 (Analyze)
CO4	Illustrate the linear application of operational amplifiers.	K4 (Analyze)
CO5	Estimate the parameters and designing of filter and PLL.	K4 (Analyze)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3	2	3	3				3	3			3	3		
CO2	3	3	2	3	3				3	3			3	3		
CO3	3	3	2	3	3				3	3			3			
CO4	3	3	2	3	3				3	3			3	3		
CO5	3	3	2	3	3				3	3			3	3		
Average	2.5	2.5	1.67	2.5	2.5				2.5	2.5			2.5	3		

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CO-PO-PSO MAPPING

Ref: AICTE Examination Reforms (w.e.f. November, 2018) & Prof. Dr.) N.J.Rao, IISc Banglore, NPTEL, https://www.youtube.com/watch?v=28mjSlfKWic

NAME OF SUBJECT WITH SUBJECT CODE: Microprocessor & Microcontroller Lab (KEC-552)	**NAME(S) OF FACULTY INVOLVED:** Ms. Ranjeeta Yadav , Ms. Tania Gupta, Mr. Rajeev Pandey
SESSION: 2022-23	**YEAR / SEM:** III / V

Course Outcome No.	**Statements**	**Knowledge Level, KL**
CO1	Use techniques, skills, modern engineering tools, instrumentation and software/hardware appropriately to list and demonstrate arithmetic and logical operations on 8 bit data using microprocessor 8085.	K3 [Apply]
CO2	Examine 8085 & 8086 microprocessor and its interfacing with peripheral devices.	K3 [Apply]
CO3	State various conversion techniques using 8085 & 8086 and generate waveforms using 8085.	K3 [Apply]
CO4	Implement programming concept of 8051 Microcontroller.	K3 [Apply]
CO5	Design concepts to Interface peripheral devices with Microcontroller so as to design Microcontroller based projects.	K3 [Apply]

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3	2	3	2	3		3	3	3		3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	2	3	1	3	3	3		3	3	3		3	3	3	3	3
CO4	2	2	2	2	1	3		3	3	3		3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Average	2.6	2.8	2.2	2.8	2.4	3	3	3	3	3	3	3	3	3	3	3

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CO-PO-PSO MAPPING

Ref: AICTE Examination Reforms (w.e.f. November, 2018) & Prof. Dr.) N.J.Rao, IISc Banglore, NPTEL, https://www.youtube.com/watch?v=28mjSlfKWic

NAME OF SUBJECT WITH SUBJECT CODE: Digital Signal Processing Lab (KEC-553)	**NAME(S) OF FACULTY INVOLVED:** Dr. Devvrat Tyagi, Ms. Shobha Sharma, Dr. MangalDeep Gupta,
SESSION: 2022-23	**YEAR / SEM:** III / V

Course Outcome No.	**Statements**	**Knowledge Level, KL**
CO1	Create and visualize various discrete/digital signals using MATLAB/Scilab	K4 [Analyze]
CO2	Implement and test the basic operations of Signal Processing	K4 [Analyze]
CO3	Examine and analyze the spectral parameters of window functions	K4 [Analyze]
CO4	Design IIR and FIR filters for band pass, band stop, low pass and high pass filters.	K4 [Analyze]
CO5	Construct the signal processing algorithms using MATLAB/Scilab.	K4 [Analyze]

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3	2	2	3				3	2		3	3	3	3	2
CO2	3	3	2	2	3				3	2		3	3	3	3	2
CO3	3	3	2	2	3				3	2		3	3		3	2
CO4	3	3	2	2	3				3	2		3	3	3	3	2
CO5	3	3	2	2	3				3	2		3	3	3	3	2
Average	3	3	2	2	3				3	2		3	3	3	3	2

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CO-PO-PSO MAPPING

Ref: AICTE Examination Reforms (w.e.f. November, 2018) & Prof. Dr.) N.J.Rao, IISc Banglore, NPTEL, https://www.youtube.com/watch?v=28mjSlfKWic

NAME OF SUBJECT WITH SUBJECT CODE: Mini Project and Internship Lab Assessment (KEC-554)	**NAME(S) OF FACULTY INVOLVED:** Dr. Himani Garg, Mr. Sanjeev Saini, Ms. Ranjeeta Yadav, Mr. Shailendra Bisariya, Mr. Navneet Sharma, Mr. Rajeev Pandey
SESSION:2022-23	**YEAR / SEM:** III / V

Course Outcome No.	Statements	Knowledge Level, KL
CO1	Understand the organ gram of the industry and appreciate the skill enhancement	K5 (Understand)
CO2	Write an effective mini-project or internship report	K3 (Apply)
CO3	Deliver an effective presentation	K3 (Apply)
CO4	Inculcate non-plagiarism and team work ethics	K3 (Apply)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	3		3	3	3	3		3	3	3	3	3
CO2	1	3	3	3	3			3	3	3		3	3	3	3	3
CO3	1	3	3	3	3			3	3	3		3	3	3	3	3
CO4	1	3	3	3	3			3	3	3		3	3	3	3	3
Average	1.5	3	3	3	3		3	3	3	3		3	3	3	3	3

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CO-PO-PSO MAPPING Ref: AICTE Examination Reforms (w.e.f. November, 2018) & Prof. Dr.) N.J.Rao, IISc Banglore, NPTEL, https://www.youtube.com/watch?v=28mjSlfKWic	
NAME OF SUBJECT WITH SUBJECT CODE: Digital communication (KEC-601)	**NAME(S) OF FACULTY INVOLVED:** Dr. Priyanka Bharadwaj Ms. Upasana Sharma
SESSION:2022-23	**YEAR / SEM:** III / VI

Course Outcome No.	Statements	Knowledge Level, KL
CO1	To formulate basic statistics involved in communication theory.	K3 [Apply]
CO2	To demonstrate the concepts involved in digital communication.	K3 [Apply]
CO3	To explain the concepts of digital modulation schemes.	K2 [Understand]
CO4	To analyze the performance of digital communication systems.	K3 [Apply]
CO5	To apply the concept of information theory in digital systems.	K4 [Analyze

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	3	3	2			3	1	3	3	3	3	3
CO2	3	3	2	3	3	3	2			3		3	3	3	3	3
CO3	2	3	3	3	3	3	3			3	1	3	3	3	3	3
CO4	3	3	3	3	3	3	3			3	1	3	3	3	3	3
CO5	3	3	3	3	3	3	2			3	2	3	3	3	3	3
Average	2.8	3	2.8	3	3	3	2.4			3	1.25	3	3	3	3	3

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CO-PO-PSO MAPPING Ref: AICTE Examination Reforms (w.e.f. November, 2018) & Prof. Dr.) N.J.Rao, IISc Banglore, NPTEL, https://www.youtube.com/watch?v=28mjSlfKWic	
NAME OF SUBJECT WITH SUBJECT CODE: Control System [KEC-602]	**NAME(S) OF FACULTY INVOLVED:** Dr. Raman Kapoor, Ms. Ritu Aggarwal
SESSION:2022-23	**YEAR / SEM:** III / VI

Course Outcome No.	Statements	Knowledge Level, KL
CO1	Describe the basics of control systems along with different types of feedback and its effect. Additionally they will also be able to explain the techniques such as block diagrams reduction, signal flow graph and modelling of various physical systems along with modelling of DC servomotor.	K4 (Analyze)
CO2	Explain the concept of state variables for the representation of LTI system.	K4 (Analyze)
CO3	Interpret the time domain response analysis for various types of inputs along with the time domain specifications.	K3 (Apply)
CO4	Distinguish the concepts of absolute and relative stability for continuous data systems along with different methods.	K4 (Analyze)
CO5	Interpret the concept of frequency domain response analysis and their specifications.	K4 (Analyze)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	3					2		3	3	3	3	2
CO2	3	3	3	2	3					2		3	3	3	3	2
CO3	3	3	2	3	3					2		3	3	3	3	2
CO4	2	3	1	3	3					2		3	3	3	3	2
CO5	3	3	2	3	3					2		3	3	3	3	2
Average	2.8	3	2	2.6	3					2		3	3	3	3	2

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CO-PO-PSO MAPPING Ref: AICTE Examination Reforms (w.e.f. November, 2018) & Prof. Dr.) N.J.Rao, IISc Banglore, NPTEL, https://www.youtube.com/watch?v=28mjSlfKWic	
NAME OF SUBJECT WITH SUBJECT CODE: Antenna and Wave Propagation [KEC 603]	**NAME(S) OF FACULTY INVOLVED:** Dr.Manish Zadoo, Dr. Manidipa Roy, Dr. Jugul Kishor
SESSION:2022-23	**YEAR / SEM:** III / VI

Course Outcome No.	Statements	Knowledge Level, KL
CO1	Identify different coordinate systems and their applications in electromagnetic field theory to establish a relation between any two systems using the vector calculus.	K3 [Apply]
CO2	Explain the concept of static electric field, current and properties of conductors.	K2 [Understand]
CO3	Express the basic concepts of ground, space, sky wave propagation mechanism.	K2 [Understand]
CO4	Demonstrate the knowledge of antenna fundamentals and radiation mechanism of the antenna.	K2 [Understand]
CO5	Analyze and design different types of basic antennas.	K4 [Analyze]

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2			3	2					3	3			3
CO2	3	3	2			3	2					3	3		3	3
CO3	3	3	2			3	2					3	3		3	3
CO4	3	3	2			3	2					3	3		3	3
CO5	3	3	3			3	3					3	3		3	3
Average	3	3	2.2			3	2.2					3	3		3	3

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CO-PO-PSO MAPPING

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NAME OF SUBJECT WITH SUBJECT CODE: Data Communication Networks [KEC-063]	**NAME(S) OF FACULTY INVOLVED:** Ms. Khusbhu Bansal, Ms. Pallavie Tyagi
SESSION:2022-23	**YEAR / SEM:** III / VI

Course Outcome No.	Statements	Knowledge Level, KL
CO1	Explain basic concepts, OSI reference model, services and role of each layer of OSI model and tcp/ip, networks devices and transmission media, analog and digital data transmission	K2 (Understand)
CO2	Apply channel allocation, framing, error and flow control techniques	K3 (Apply)
CO3	Interpret the functions of network layer i.e. logical addressing, subnetting & routing mechanism.	K3 (Apply)
CO4	Examine the different functions of transport layer i.e. port addressing, connection management, error control and flow control mechanism.	K3 (Apply)
CO5	Illustrate the functions offered by session and presentation layer	K2 (Understand)
CO6	Explain the different protocols used at application layer i.e. HTTP, SNMP, SMTP, FTP, Telnet and VPN.	K2 (Understand)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	1		3	3	3		3	2	3	3		3	2
CO2	2	2	1	1		3	3	3		3	2	3	3		3	2
CO3	2	2	1	1		3	3	3		3	2	3	3		3	2
CO4	2	2	1	1		3	3	3		3	2	3	3		3	2
CO5	2	2	1	1		3	3	3		3	2	3	3		3	2
CO6	2	2	1	1		3	3	3		3	2	3	3		3	2
Average	2	2	1	1		3	3	3		3	2	3	3		3	2

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CO-PO-PSO MAPPING

Ref: AICTE Examination Reforms (w.e.f. November, 2018) & Prof. Dr.) N.J.Rao, IISc Banglore, NPTEL, https://www.youtube.com/watch?v=28mjSlfKWic

NAME OF SUBJECT WITH SUBJECT CODE: Basics Of DBMS (KOE067)	**NAME(S) OF FACULTY INVOLVED:** Dr. Puneet Garg, Dr. Meeta Chaudhary
SESSION:2022-23	**YEAR / SEM:** III / VI

Course Outcome No.	Statements	Knowledge Level, KL
CO1	Describe the features of a database system and its application and compare various types of data models.	K2 [Understand]
CO2	Construct an ER Model for a given problem and transform it into a relation database schema.	K6 [Create]
CO3	Formulate solution to a query problem using SQL Commands, relational algebra, tuple calculus and domain calculus.	K6 [Create]
CO4	Explain the need of normalization and normalize a given relation to the desired normal form.	K3 [Apply]
CO5	Explain different approaches to transaction processing and concurrency control.	K2 [Understand]

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1			1												
CO2	1	2	3	3	3		3		3	3	1	3		3		
CO3	2	3	2	3	3	3	2		2		1	3	2			
CO4	1	1	1	1					1			3	3			
CO5	1	1										3				
Average	1.2	1.75	2	2	3	3	2.5		2	3	1	3	2.5	3		

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CO-PO-PSO MAPPING

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NAME OF SUBJECT WITH SUBJECT CODE: DIGITAL COMMUNICATION LAB (KEC651)	**NAME(S) OF FACULTY INVOLVED:** Dr. Ajay Suri, Dr. Manidipa Roy, Ms. Geeranjali Raj
SESSION:2022-23	**YEAR / SEM:** III / VI

Course Outcome No.	Statements	Knowledge Level, KL
CO1	To formulate basic concepts of pulse shaping in digital communication	K3 [Apply]
CO2	To identify different line coding techniques and demonstrate the concepts.	K3 [Apply]
CO3	To design equipments related to digital modulation and demodulation schemes.	K2 [Understand]
CO4	analyze the performance of digital communication systems.	K4 [Analyze]
CO5	To conceptualize error detection & correction using different coding schemes in digital communication.	K3 [Apply]

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	1	3								3	3	3	3	3
CO2	3	3		3								3	3	3	3	3
CO3	3	3	2	3		3						3	3	3	3	3
CO4	3	3	2	3								3	3	3	3	3
CO5	3	3	2	3								3	3	3	3	3
Average	3	3	1.75	3		3						3	3	3	3	3

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CO-PO-PSO MAPPING

Ref: AICTE Examination Reforms (w.e.f. November, 2018) & Prof. Dr.) N.J.Rao, IISc Banglore, NPTEL, https://www.youtube.com/watch?v=28mjSlfKWic

NAME OF SUBJECT WITH SUBJECT CODE: CONTROL SYSTEM LAB (KEC-652)	**NAME(S) OF FACULTY INVOLVED:** Dr. Jugul Kishore Gupta, Dr. Raman Kapoor, Ms. Ritu Aggarwal, Mr. Hitesh Tomar,
SESSION:2022-23	**YEAR / SEM:** III / VI

Course Outcome No.	Statements	Knowledge Level, KL
CO1	Classify different tools in MATLAB along with the basic matrix operations used in MATLAB.	K4 [Analyze]
CO2	Evaluate the poles and zeros on s-plane along with transfer function of a given system.	K4 [Analyze]
CO3	Construct state space model of a linear continuous system.	K4 [Analyze]
CO4	Evaluate the various specifications of time domain response of a given system.	K4 [Analyze]
CO5	Appraise the steady state error of a given transfer function.	K4 [Analyze]
CO6	Examine the relative stability of a given transfer function using various methods such as root locus, Bode plot and Nyquist plot.	K4 [Analyze]

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	3				3	2		3	3	3	3	2
CO2	3	3	2	2	3				3	2		3	3	3	3	2
CO3	3	3	2	2	3				3	2		3	3		3	2
CO4	3	3	2	2	3				3	2		3	3	3	3	2
CO5	3	3	2	2	3				3	2		3	3	3	3	2
CO6	3	3	2	2	3				3	2		3	3	3	3	2
Average	3	3	2	2	3				3	2		3	3	3	3	2

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CO-PO-PSO MAPPING Ref: AICTE Examination Reforms (w.e.f. November, 2018) & Prof. Dr.) N.J.Rao, IISc Banglore, NPTEL, https://www.youtube.com/watch?v=28mjSlfKWic	
NAME OF SUBJECT WITH SUBJECT CODE: CAD of Electronics Lab (KEC-653)	**NAME(S) OF FACULTY INVOLVED:** Mr. Shailendra Bisariya, Ms. Upasana Sharma, Ms. Pallavie Tyagi, Mr. Rajeev Pandey,
SESSION:2022-23	**YEAR / SEM:** III / VI

Course Outcome No.	Statements	Knowledge Level, KL
CO1	Design and analyze the performance of different type of inverters.	K4 [Analyze]
CO2	Design and analyze the performance of the basic logic gates using CMOS inverter circuit.	K4 [Analyze]
CO3	Design and analyze the performance of the memory based digital circuits using CMOS inverter circuit.	K4 [Analyze]
CO4	Analyze the performance of the different configuration of MOS amplifier circuits.	K4 [Analyze]

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	3				3	3		3	3	3	3	2
CO2	3	3	3	3	3				3	3		3	3	3	3	2
CO3	3	3	3	3	3				3	3		3	3	3	3	2
CO4	3	3	3	3	3				3	3		3	3	3	3	2
CO5	3	3	3	3	3				3	3		3	3	3	3	2
Average	3	3	3	3	3				3	3		3	3	3	3	2

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CO-PO-PSO MAPPING Ref: AICTE Examination Reforms (w.e.f. November, 2018) & Prof. Dr.) N.J.Rao, IISc Banglore, NPTEL, https://www.youtube.com/watch?v=28mjSlfKWic	
NAME OF SUBJECT WITH SUBJECT CODE: Project Management & EntrepreneurshipKHU-702	**NAME(S) OF FACULTY INVOLVED:** Dr. Rahul Verma
SESSION:2022-23	**YEAR / SEM:** IV / VII

Course Outcome No.	Statements	Knowledge Level, KL
CO1	Understand need, scope and definition of entrepreneurship.	K2 (Understand)
CO2	Explain innovation and create sustaining enterprising model.	K2 (Understand)
CO3	Discuss project management: meaning, scope & importance, role of project manager.	K2 (Understand)
CO4	Estimate project cost & working capital requirements.	K3 (Apply)
CO5	Analyze social sector perspectives and social entrepreneurship.	K4 (Analyze)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1		1	1	1	2	3	3	3	3	1	3	2				3
CO2	1	3	3	3	3	3	3	3	3	2	3	3		2	2	3
CO3	1	1	1	1	1	2	2	3	3	3	3	2				2
CO4						3	3	3			3	2				3
CO5	1	2	2	1	1	3	3	3	2	1		1				3
Average	1	1	1.75	1.5	1.75	2.8	2.8	3	2.75	1.75	3	2		2	2	2.8

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CO-PO-PSO MAPPING Ref: AICTE Examination Reforms (w.e.f. November, 2018) & Prof. Dr.) N.J.Rao, IISc Banglore, NPTEL, https://www.youtube.com/watch?v=28mjSlfKWic	
NAME OF SUBJECT WITH SUBJECT CODE: VLSI Design [KEC-072]	**NAME(S) OF FACULTY INVOLVED:** Ms. Pallavie Tyagi
SESSION:2022-23	**YEAR / SEM:** IV / VII

Course Outcome No.	Statements	Knowledge Level, KL
CO1	Express the concept of VLSI design and CMOS circuits and delay study.	K2 (Understand)
CO2	Analyze mathematical methods and circuit analysis models in analysis of CMOS digital electronics circuits.	K4 (Analyze)
CO3	Design and analyze various combinational & sequential circuits based on CMOS technology.	K4 (Analyze)
CO4	Examine power logic circuits and different semiconductor memories used in present day technology.	K3 (Apply)
CO5	Interpret faults in digital circuits, Fault Models and various Testing Methodologies	K3 (Apply)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2	3	3	2			2		3	3	3	3	2
CO2	3	3	3	3	2	3				2		3	3	3	3	2
CO3	3	3	3	3	3	3				2		3	3	3	3	2
CO4	3	3	3	2	2	3				2		3	3	3	3	2
CO5	3	2	3	3	2	3				2		3	3	3	3	2
Average	3	2.8	3	2.6	2.4	3	2			2		3	3	3	3	2

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CO-PO-PSO MAPPING Ref: AICTE Examination Reforms (w.e.f. November, 2018) & Prof. Dr.) N.J.Rao, IISc Banglore, NPTEL, https://www.youtube.com/watch?v=28mjSlfKWic	
NAME OF SUBJECT WITH SUBJECT CODE: Information Theory and Coding (KEC 075)	**NAME(S) OF FACULTY INVOLVED:** Shilpa Srivastava
SESSION:2022-23	**YEAR / SEM:** IV / VII

Course Outcome No.	Statements	Knowledge Level, KL
CO1	To learn basic of Entropy.	K2 [Understand]
CO2	To learn Asymptotic Equipartition Property.	K2 [Understand]
CO3	To learn Channel Capacity.	K2 [Understand]
CO4	To learn the implementation of Block Codes	K2 [Understand]
CO5	To learn the Convolution Codes	K2 [Understand]

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	3		3					3	3	3	3	3
CO2	3	3	3	3	3							3	3	3	3	3
CO3	3	3	3	3	3							3	3	3	3	3
CO4	3	3	3	3	3							3	3	3	3	3
CO5	3	3	3	3	3							3	3	3	3	3
Average	3	3	3	3	3		3					3	3	3	3	3

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CO-PO-PSO MAPPING Ref: AICTE Examination Reforms (w.e.f. November, 2018) & Prof. Dr.) N.J.Rao, IISc Banglore, NPTEL, https://www.youtube.com/watch?v=28mjSlfKWic	
NAME OF SUBJECT WITH SUBJECT CODE: Wireless and Mobile Communication (KEC 076)	**NAME(S) OF FACULTY INVOLVED:** Dr. Jugal Kishore
SESSION:2022-23	**YEAR / SEM:** IV / VII

Course Outcome No.	Statements	Knowledge Level, KL
CO1	Express the basic knowledge of mobile radio & cellular communication fundamentals and their application to propagation mechanisms, path loss models and multi-path phenomenon.	K3 [Apply]
CO2	Analyze the performance of various voice coding and diversity techniques.	K3 [Apply]
CO3	Apply the knowledge of wireless transmission basics to understand the concepts of equalization and multiple access techniques.	K3 [Apply]
CO4	Examine the performance of cellular systems being employed such as gsm, cdma and lte using various theoretical and mathematical aspects.	K2 [Understand]
CO5	Describe basic knowledge of mobile adhoc networks and the existing & upcoming data communication networks in wireless and mobile communication domain.	K3 [Apply]

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	1		3	2			3	1	3	3			3
CO2	3	3	3	1		3	2			3	1	3	3		3	3
CO3	3	3	3	1		3	2			3	3	3	3		3	3
CO4	3	3	2	1		3	2	2		3	3	3	3		3	3
CO5	3	3	3	3	3	3	3	2		3	2	3	3	3	3	3
Average	3	3	2.6	1.4	3	3	2.2	2		3	2	3	3	3	3	3

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CO-PO-PSO MAPPING Ref: AICTE Examination Reforms (w.e.f. November, 2018) & Prof. Dr.) N.J.Rao, IISc Banglore, NPTEL, https://www.youtube.com/watch?v=28mjSlfKWic	
NAME OF SUBJECT WITH SUBJECT CODE: Renewable Energy Resources [KOE-074]	**NAME(S) OF FACULTY INVOLVED:** Ms. Geetanjali Raj
SESSION:2022-23	**YEAR / SEM:** IV / VII

Course Outcome No.	Statements	Knowledge Level, KL
CO1	Distinguish about different types of renewable and nonrenewable energy resources and review their advantages and disadvantages. Also demonstrate the working and limitations of various solar cells, solar arrays and solar cell power plants	K3 (Apply)
CO2	Discuss the solar radiation and understand the working of flat plate and concentrating collectors. Also explain the working of various solar thermal power plants and thermal energy storage devices	K2 (Understand)
CO3	Identify the types of geothermal resources, its impact on environment and interpret the geothermal to electrical & non-electrical energy conversion. Also compare the working, performance and limitations of MHD Power Plants & different types of fuel cells.	K2 (Understand)
CO4	Interpret the thermo-electrical power conversion and thermionic power conversion and explain wind energy, energy estimation of wind, types of rotors and energy conversion systems.	K3 (Apply)
CO5	Explain the availability of forms of biomass and their conversion to energy. Also explain the working principle of ocean thermal energy, wave energy, tidal energy and waste recycling plants	K2 (Understand)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2			3	2					3	3		3	3
CO2	3	3	1			3	2					3	3		3	3
CO3	3	3	1			3	2					3	3		3	3
CO4	3	3	1			3	2					3	3		3	3
CO5	3	3	1			3	2					3	3		3	3
Average	3	3	1.2			3	2					3	3		3	3

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CO-PO-PSO MAPPING Ref: AICTE Examination Reforms (w.e.f. November, 2018) & Prof. Dr.) N.J.Rao, IISc Banglore, NPTEL, https://www.youtube.com/watch?v=28mjSlfKWic	
NAME OF SUBJECT WITH SUBJECT CODE: VLSI Design Lab [KEC-751B]	**NAME(S) OF FACULTY INVOLVED:** Dr. Raman Kapoor & Ms. Pallavie Tyagi
SESSION:2021-22	**YEAR / SEM:** IV / VII

Course Outcome No.	Statements	Knowledge Level, KL
CO1	Designing of Logic Gates.	K3 (Apply)
CO2	Implementation of combinational and sequential circuits using CMOS logic.	K3 (Apply)
CO3	Analyze amplifier circuits.	K4 (Analyze)
CO4	Design sequential circuits such as flip flop.	K3 (Apply)
CO5	Do the layout designing for physical analysis of the MOS transistor and MOS based circuits.	K4 (Analyze)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	1	3		2					3	3	3	3	
CO2	2	3	1	2	1							3	3	3	3	
CO3	2	2	1	2	3							3	3	3	3	
CO4	2	3	1	1	1							3	3	3	3	
CO5	2	2	2	2	1							3	3	3	3	
Average	2	2.4	1.2	1.6	1.8		2					3	3	3	3	

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CO-PO-PSO MAPPING Ref: AICTE Examination Reforms (w.e.f. November, 2018) & Prof. Dr.) N.J.Rao, IISc Banglore, NPTEL, https://www.youtube.com/watch?v=28mjSlfKWic	
NAME OF SUBJECT WITH SUBJECT CODE: Mini Project and Internship (KEC-752)	**NAME(S) OF FACULTY INVOLVED:** Ms. Khusbhu Bansal, Ms. Tania Gupta,
SESSION:2022-23	**YEAR / SEM:** IV / VII

Course Outcome No.	Statements	Knowledge Level, KL
CO1	Understand the organogram of the industry and appreciate the skill enhancement	K5 [Understand]
CO2	Write effective training report	K3 [Apply]
CO3	Deliver an effective presentation	K3 [Apply]
CO4	Prepare well organized training diary	K3 [Apply]

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	3		3	3	3	3		3	3	3	3	3
CO2	1	3	3	3	3			3	3	3		3	3	3	3	3
CO3	1	3	3	3	3			3	3	3		3	3	3	3	3
CO4	1	3	3	3	3			3	3	3		3	3	3	3	3
Average	1.5	3	3	3	3		3	3	3	3		3	3	3	3	3

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CO-PO-PSO MAPPING Ref: AICTE Examination Reforms (w.e.f. November, 2018) & Prof. Dr.) N.J.Rao, IISc Banglore, NPTEL, https://www.youtube.com/watch?v=28mjSlfKWic	
NAME OF SUBJECT WITH SUBJECT CODE: Project I (KEC753)	**NAME(S) OF FACULTY INVOLVED:** [Prof. (Dr.)Sanjay Kr. Singh, Prof. (Dr.) Priyanka Bharadwaj, Mr. Manish, Dr. Jugul Kishore, Dr. Manidipa Roy, Mr. Mudit Saxena, Ms. Khushbu Bansal, Ms. Pallavie Tyagi, Ms. Geetanjali Raj]
SESSION:2022-23	**YEAR / SEM:** IV / VII

Course Outcome No.	Statements	Knowledge Level, KL
CO1	An ability to prepare proposal which is relevant to subject of engineering.	K4 (Analyze)
CO2	An ability to design the system components and process and identify the engineering tools.	K5 (Evaluate)
CO3	An ability to use management skills and implement the task, manages problems encountered, work as a team and present the work progress	K6 (Create)
CO4	An ability to incorporate the suggestions made and manages resources and work as team.	K6 (Create)
CO5	An ability to write a document with standard technical report writing procedures.	K4 (Analysis)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	1		3	3	2			1	3	3		3	3
CO2	3	3	3	1		3			3		1	3	3		3	3
CO3	3	3	2	1	1	3			3		1	3	3		3	3
CO4	3	3	2	1	1	3					1	3	3	3	3	3
CO5										2						3
Average	3	3	2.25	1	1	3	3	2	3	2	1	3	3	3	3	3

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CO-PO-PSO MAPPING

Ref: AICTE Examination Reforms (w.e.f. November, 2018) & Prof. Dr.) N.J.Rao, IISc Banglore, NPTEL, https://www.youtube.com/watch?v=28mjSlfKWic

NAME OF SUBJECT WITH SUBJECT CODE: Rural Development: Administration and Planning (KHU-802)	**NAME(S) OF FACULTY INVOLVED:**
SESSION:2022-23	**YEAR / SEM:** IV / VIII

Course Outcome No.	Statements	Knowledge Level, KL
CO1	Understand need, scope and definition of entrepreneurship.	K2 (Understand)
CO2	Explain innovation and create sustaining enterprising model.	K2 (Understand)
CO3	Discuss project management: meaning, scope & importance, role of project manager.	K2 (Understand)
CO4	Estimate project cost & working capital requirements.	K3 (Apply)
CO5	Analyze social sector perspectives and social entrepreneurship.	K4 (Analyze)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1						2	3		1			3				3
CO2						3	2				3	3				3
CO3						3	3	2	1	1	2	3				3
CO4						3					3	3				3
CO5						3	1	1	3	1		3				3
Average						2.8	2.25	1.5	1.67	1	2.67	3				3

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CO-PO-PSO MAPPING

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NAME OF SUBJECT WITH SUBJECT CODE: Cloud Computing (KOE-081)	**NAME(S) OF FACULTY INVOLVED:**
SESSION:2022-23	**YEAR / SEM:** IV / VIII

Course Outcome No.	Statements	Knowledge Level, KL
CO1	Detect the trade-offs between deploying applications in the cloud and over the local infrastructure.	K2 (Understand)
CO2	Compare the advantages and disadvantages of various cloud computing platforms.	K2 (Understand)
CO3	Analyze the performance, scalability, and availability of the underlying cloud technologies and software.	K2 (Understand)
CO4	Identify security and privacy issues in cloud computing.	K3 (Apply)
CO5	Explain recent technologies and advancements in cloud computing and identify their application area.	K4 (Analyze)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3											2			2
CO2	1	2														
CO3		3	1	1												
CO4	1	1	2			1	2	2								
CO5			2			2	1					2				
Average	1.33	2.25	1.66	1		1.5	1.5	2				2	2			2

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CO-PO-PSO MAPPING

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NAME OF SUBJECT WITH SUBJECT CODE: DIGITAL AND SOCIAL MEDIA MARKETING [KOE-094]	**NAME(S) OF FACULTY INVOLVED:** Mr. RAJEEV KUMAR PANDEY
SESSION:2022-23	**YEAR / SEM:** IV / VIII

Course Outcome No.	Statements	Knowledge Level, KL
CO1	Explain trends that are driving shifts from traditional marketing practices to digital marketing practices.	K2 (Understand)
CO2	Describe different strategies used in Social Media Marketing.	K2 (Understand)
CO3	Generalize steps used to Acquire & Engage Users through Digital Channels.	K2 (Understand)
CO4	Design Organization for Digital Success.	K4 (Analyze)
CO5	Compare different Digital Innovation and Trends.	K4 (Analyze)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1			1	1	2	3	2	3		2		3				
CO2			1	3	2	3	3	3		3	2	3				2
CO3		2	1	3	2	3	3	3		3	3	3				2
CO4		2	1	3	2	3	3	3	3	2	3	1				2
CO5		1	1	1	2	3	2	3		2	1	3				
Average		1.67	1	2.2	2	3	2.6	3	3	2.4	2.25	2.6				2

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CO-PO-PSO MAPPING Ref: AICTE Examination Reforms (w.e.f. November, 2018) & Prof. Dr.) N.J.Rao, IISc Banglore, NPTEL, https://www.youtube.com/watch?v=28mjSlfKWic	
NAME OF SUBJECT WITH SUBJECT CODE: Project II (KEC851)	**NAME(S) OF FACULTY INVOLVED:** Prof.(Dr.) Priyanka Bhardwaj, Mr. Manish, Dr. Jugul Kishore Gupta, Dr. Manidipa Roy, Ms. Shilpa Srivastava, Ms. Geetanjali Raj
SESSION:2022-23	**YEAR / SEM:** IV / VIII

Course Outcome No.	Statements	Knowledge Level, KL
CO1	An ability to prepare proposal which is relevant to subject of engineering.	K4 (Analyze)
CO2	An ability to design the system components and process and identify the engineering tools.	K5 (Evaluate)
CO3	An ability to use management skills and implement the task, manages problems encountered, work as a team and present the work progress	K6 (Create)
CO4	An ability to incorporate the suggestions made and manages resources and work as team.	K6 (Create)
CO5	An ability to write a document with standard technical report writing procedures.	K4 (Analysis)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	3	3		3	0	3	2			1	3	3		3	3
CO2	3	3	3		2	0			3		1	3	3		3	3
CO3	2	1	1	3	1	2			3		1	3	3		3	3
CO4	3			3	2	3					1	3	3	3	3	3
CO5			1		1	0	0	0	0	2						3
Average	2.25	2.33333	2	3	1.8	1	1.5	1	2	2	1	3	3	3	3	3