IKG Punjab Technical University

Syllabus (3rd-8th Semester)

for

Undergraduate Degree Programme

Bachelor of Technology

ELECTRONICS AND COMMUNICATION ENGINEERING

Scheme & Syllabus

2018 & onwards

Structure of Distribution of credits Electronics & Communication Engineering Program as per AICTE Model Curriculum 2018:

Sr. No.	Category	Suggested Breakup of Credits (Total 160)
1	Humanities and Social Science including Management courses	12*
2	Basic Sciences courses	25*
3	Engineering Science courses-including workshop, drawing, basics of electrical/mechanical/computer etc.	24*
4	Professional Core courses	48*
5	Professional Elective courses relevant to chosen specialization/branch	18*
6	Open subjects - Electives from other technical and/or emerging subjects	18*
7	Project Work, Seminar and Internship in Industry or elsewhere	15*
8	Mandatory Courses [Environmental Sciences, Induction Program, Indian Constitution, Essence of Indian Traditional Knowledge]	(non-credit)
	Total	160*

**Minor Variation is allowed as per need of the respective disciplines.*

VISION

To impart quality education and create skilled technocrats & innovative entrepreneurs that meet to global challenges in the area of Electronics and Communication Engineering (ECE) at under graduate level.

MISSION

1. To impart outcome-based curriculum inculcating comprehensive fundamental domain knowledge meant to meet current industrial expectations.
2. To provide state-of-the-art infrastructure supported with best teaching-learning environment for practical realization of theoretical concepts.
3. To produce technocrats, researchers and entrepreneurs with inherent human values who can tackle challenges of professional career.

PROGRAMME EDUCATIONAL OBJECTIVES

1. Ability to generalize fundamental domain knowledge while working with electronic equipment/systems to handle engineering problems in professional career.
2. Ability to get profound knowledge of modern techniques, EDA tools and to acquire technical skills to innovate new/existing solutions to engineering problems.
3. Graduates will be known leaders in Electronics and Comm. Engineering and associated domains of engineering due their ability solve real-world inter-disciplinary problem.

PROGRAMME OUTCOMES (POS)

1. **Engineering Knowledge**: Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
2. **Problem Analysis**: Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
3. **Design/Development of Solutions**: Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.
4. **Conduct** investigations of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.
5. **Modern Tool Usage**: Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The Engineer and Society**: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
7. **Environment and Sustainability**: Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
9. **Individual and Team Work**: Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.
10. **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.
11. **Project Management and Finance**: Demonstrate knowledge and understanding of 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.
12. **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.

PROGRAMME SPECIFIC OUTCOMES (PSOS)

1. **Working with Instruments**: Appreciate working of electronic equipment/systems guided by practical experience and theoretical fundamental knowledge of Electronics & Communication Engineering.
2. **Extrapolating Domain Knowledge**: Ability to provide solutions to real-world problems in the field of Electronics & Communication Engineering by extrapolating the fundamental knowledge of electronic devices, circuits, embedded & communication systems.
3. **Innovation and Design Ability**: Innovative thinking and ability to design and/or improve products and/or systems for the society and industry for better utilization, human safety and reduced cost.

Semester III [Second year]										
Branch/Course: Electronics and Communication Engineering										
Sr. No.	**Course code**	**Course Title**	**L**	**T**	**P**	**Hrs**	**Internal Marks**	**External Marks**	**Total**	**Credits**
1	BTEC- 301-18	Electronic Devices	3	0	0	3	40	60	100	3
2	BTEC- 302-18	Digital System Design	3	0	0	3	40	60	100	3
3	BTEC- 303-18	Electromagnetic Waves	3	1	0	4	40	60	100	4
4	BTEC-304-18	Network Theory	3	1	0	4	40	60	100	4
5	BTAMXXX18	Mathematics III	3	1	0	4	40	60	100	4
6	BTEC-311-18	Electronic Devices Laboratory	0	0	2	2	30	20	50	1
7	BTEC-312-18	Digital System Design Laboratory	0	0	2	2	30	20	50	1
8	HSMC101-18 /HSMC102-18*	Foundational Course in Humanities (Development of Societies or Philosophy)	3	0	0	3	40	60	100	3
9	BTEC-321-18	4-Week Institutional Training	0	0	4	3	40	60	100	Non-credit
10	BMPD-331-18	Mentoring and Professional Development	0	0	2	Satisfactory/Un-satisfactory				Non-credit
		Total	**18**	**3**	**10**	**25**	**360**	**440**	**800**	**23**

Semester IV [Second year]										
Branch/Course: Electronics and Communication Engineering										
Sr. No.	**Course code**	**Course Title**	**L**	**T**	**P**	**Hrs**	**Internal Marks**	**External Marks**	**Total Marks**	**Credits**
1	BTEC-401-18	Analog Circuits	3	1	0	4	40	60	100	4
2	BTEC-402-18	Microprocessors and Microcontrollers	3	0	0	3	40	60	100	3
3	BTCS-301-18	Data Structures & Algorithms	3	0	0	3	40	60	100	3
4	BTEC-403-18	Signals and Systems	3	1	0	4	40	60	100	4
5	HSMC122-18	Universal Human Values – 2: Understanding Harmony	3	0	0	3	40	60	100	3
6	EVS-101-18	Mandatory Course- Environmental Sciences	2	0	0	2	50	0	50	Non-credit
7	BTEC-411-18	Analog Circuits Laboratory	0	0	2	2	30	20	50	1
8	BTEC-412-18	Microprocessors and Microcontrollers Laboratory	0	0	2	2	30	20	50	1
9	BMPD-341-18	Mentoring and Professional Development	0	0	2	Satisfactory/Un-satisfactory				Non-credit
		Total	**16**	**2**	**6**	**22**	**310**	**340**	**650**	**19**

Semester V [Third year]										
Branch/Course: Electronics and Communication Engineering										
Sr. No.	**Course code**	**Course Title**	**L**	**T**	**P**	**Hrs.**	**Internal Marks**	**External Marks**	**Total**	**Credit**
1	BTEC-501-18	Analog and Digital Communication	3	0	0	3	40	60	100	3
2	BTCS-602-18	Computer Networks	3	0	0	3	40	60	100	3
3	BTEC-503-18	Linear Integrated Circuits	3	0	0	3	40	60	100	3
4	BTEC-504-18	Control Systems	3	1	0	4	40	60	100	4
5	BTEC-901X-18	Program Elective-1	3	0	0	3	40	60	100	3
6	BTOE-XX1-18	Open Elective-1	3	0	0	3	40	60	100	3
7	BTEC-511-18	Analog and Digital Communication Laboratory	0	0	2	2	30	20	50	1
8	BTEC-512-18	Digital Signal Processing Laboratory	0	0	2	2	30	20	50	1
9	BTEC-513-18	Linear Integrated Circuits Laboratory	0	0	2	2	30	20	50	1
10	BTEC-521-18	4-Weeks Industrial Training-I	0	0	6	6	60	40	100	3
11	BTEC-10X-18	Professional Elective-1 Lab (Optional)	0	0	2	Satisfactory/Un-satisfactory				Non-credit
12	BMPD-351-18	Mentoring and Professional	0	0	2	Satisfactory/Un-satisfactory				Non-

		Development								credit
		Total	**18**	**2**	**14**	**32**	**390**	**460**	**850**	**25**

Semester VI [Third year]										
Branch/Course: Electronics and Communication Engineering										
Sr. No.	**Course code**	**Course Title**	**L**	**T**	**P**	**Hrs**	**Internal Marks**	**External Marks**	**Total**	**Credits**
1	BTEC-601-18	Wireless Communication	3	0	0	3	40	60	100	3
2	BTEC-602-18	Digital Signal Processing	3	1	0	4	40	60	100	4
3	BTEC-603-18	Optical Fibers & Communication	3	0	0	3	40	60	100	3
4	BTEC-604-18	Microwave and Antenna Engineering	3	0	0	3	40	60	100	3
5	BTEC-902X-18	Program Elective-2	3	0	0	3	40	60	100	3
6	BTOE-XX2-18	Open Elective-2	3	0	0	3	40	60	100	3
7	BTEC-611-18	Optical Fibers & Communication Lab	0	0	2	2	30	20	50	1
8	BTEC-612-18	Microwave and Antenna Engineering Laboratory	0	0	2	2	30	20	50	1
9	BTEC-621-18	Electronic Design Automation Laboratory	0	0	4	4	30	20	50	2
11	BTEC-11X-18	Professional Elective-2 Lab (Optional)	0	0	2	Satisfactory/Un-satisfactory				Non-credit
10	BMPD-361-18	Mentoring and Professional Development	0	0	2	Satisfactory/Un-satisfactory				Non-credit
		Total	**18**	**0**	**10**	**26**	**330**	**420**	**750**	**23**

Semester VII [Fourth year]										
Branch/Course: Electronics and Communication Engineering										
Sr. No.	**Course code**	**Course Title**	**L**	**T**	**P**	**Hr**	**Int Marks**	**Ext Marks**	**Total**	**Credits**
1	BTEC-903X-18	Program Elective-3	3	0	0	3	40	60	100	3
2	BTEC-904X-18	Program Elective-4	3	0	0	3	40	60	100	3
3	BTOE-XX3-18	Open Elective-3	3	0	0	3	40	60	100	3
4	BTOE-XX4-18	Open Elective-4	3	0	0	3	40	60	100	3
5	BTMS-YYY18	Project Management & Finance	3	0	0	3	40	60	100	3
6	BTMC-XXX-18	Constitution of India (Mandatory Course)	3	0	0	3	40	60	100	Non-credit
7	BTEC-731-18	Project Stage-I	0	0	4	4	60	40	100	2
8	BTEC-841-18	Seminar	0	0	2	2	100	0	100	1

9	BTEC-721-18	4-Week Industrial Training-II	0	0	6	6	60	40	100	3
10	BTEC-12X-18	Professional Elective 3 or 4 Lab (Optional)	0	0	2	Satisfactory/Un-satisfactory				Non-credit
11	BMPD-371-18	Mentoring and Professional Development	0	0	2	Satisfactory/Un-satisfactory				Non-credit
		Total	**18**	**0**	**14**	**30**	**460**	**440**	**900**	**21**

Semester VIII [Fourth year]										
Branch/Course: Electronics and Communication Engineering										
Sr. No.	**Course code**	**Course Title**	**L**	**T**	**P**	**Hrs**	**Internal Marks**	**External Marks**	**Total**	**Credits**
1	BTEC- 906X-18	Program Elective-6	3	0	0	3	40	60	100	3
2	BTEC-905X-18	Program Elective-5	3	0	0	3	40	60	100	3
3	BTOE-XY5-18	Open Elective-5	3	0	0	3	40	60	100	3
4	BTOE-XY6-18	Open Elective-6 (Humanities)	3	0	0	3	40	60	100	3
5	BTEC-831-18	Project Stage-II & Report	0	0	12	12	40	60	100	6
6	BTMC-YYY-18	Mandatory Course Essence of Indian Traditional Knowledge	2	0	0	2	40	60	100	Non-credit
7	BTEC-13X-18	Professional Elective 5 or 6 Lab (Optional)	0	0	2	Satisfactory/Un-satisfactory				Non-credit
8	BMPD-381-18	Mentoring and Professional Development	0	0	2	Satisfactory/Un-satisfactory				Non-credit
		Total	**14**	**0**	**12**	**26**	**240**	**360**	**600**	**18**
Grand Total (including 1st Year)							**2510**	**3150**	**5700**	**167**

* Student may choose any one of these as foundational course in HUSS group as given in AICTE Model Curriculum 2018.

Range of credits for Honors Degree -Minimum credits as per scheme are required by a student to be eligible to get Under Graduate degree in Electronics and Communication Engineering.

1. A student will be eligible to get Under Graduate degree with Honours, if he/she completes an additional 20 credits. These could be acquired through MOOCs and registering in the department.
2.Range of Credits and Courses for Major Degree in B. Tech. (Electronics and Communication Engineering) and Minor Degree in B.Tech. (Other Engineering)
(i) A student admitted in B. Tech (ECE) may opt for Major Degree in B. Tech. (ECE) and Minor Degree in B.Tech. (other Engineering) with effect from 3rd semester onwards.
(ii) The student must clear his/her previous two semesters.
(iii) The student/candidate will require to clear at least five theory subjects for Minor Degree in B.Tech.

IK Gujral Punjab Technical University Kapurthala

Subjects for Minor Degree in B.tech Electronics and Communication Engineering (ECE)

Core Subjects:

S.No.	Subject Code	Course Title	Credits
1.	BTEC-305-18	Basic Electronics	3
2.	BTEC-306-18	Digital Electronics	3

Elective Subjects (Odd Semester)

S.No.	Subject Code	Course Title	Credits
1.	BTEC- 301-18	Electronic Devices	4
2.	BTCS-301-18	Data Structures & Algorithms	4
3.	BTEC-504-18	Control Systems	4
4.	BTCS-ZZZ-18	Computer Networks	4
5.	BTEE-403-18	Power Electronics	4
6.	BTEC-	Fuzzy Logic and Systems	4

Elective Subjects (Even Semester)

S.No.	Subject Code	Course Title	Credits
1.	BTEC-401-18	Analog Circuits	4
2.	BTEC-402-18	Microprocessors and Microcontrollers	4
3.	BTEC-602-18	Digital Signal Processing	4
4.	BTEC-PEX	Principles of Communication	4
5.	BTEI-301-18	Electronic Measurements and Measurements	4
6.	BTME-XXX-18	Mechatronics	4

PROFESSIONAL (or PROGRAM) ELECTIVE (PE) COURSES [ELECTRONICS AND COMMUNICATION ENGINEERING]

The Professional Electives are categorized into five different Groupsviz. Information & Communication Technology (ICT), Communication Systems, Electronic Hardware, Software Development and Signal Processing. The Program Elective Groups/courses have been categorized/developed keeping in mind the employment prospects of the students. The Program design in B.Tech. ECE aims at providing domain specific knowledge to a student at UG level in progression. The Program/course design has been carried out jointly by the Academia in close coordination with Industry to provide a leading edge to the students and to prepare them as per the Industry needs.

The student is free to choose any one group out of the five listed groups. It is expected of a student to complete all the six courses from the relevant group. Therefore, the Head and the Faculty of the Department should provide complete guidance and take utmost care to apprise the students in a most diligent manner. Usually, it will not be a case to allow the change of the group, however, in the best interest of the students, a student can be allowed to change the group but the responsibility for teaching the pre requisite courses in the changed group shall rest with the Department/Institute. The permission for the same shall have to be obtained from the University with supporting reasons.

Sr. No.	Professional Elective Group	Semester	Professional Elective	Course Code	Course Title	Hrs/week	Credits
1.	**ICT Group**	V	PE-1	BTEC-905A-18	Routing and Switching	3L:0T:0P	3
2.		VI	PE-2	BTEC-905B-18	WLAN and Security	3L:0T:0P	3
3.		VII	PE-3	BTEC-905C-18	Cloud Computing and Services	3L:0T:0P	3
4.		VII	PE-4	BTEC-905D-18	Artificial Intelligence	3L:0T:0P	3
5.		VIII	PE-5	BTEC-905E-18	Introduction to Big Data	3L:0T:0P	3
6.		VIII	PE-6	BTEC-905F-18	IOT and Applications	3L:0T:0P	3
7.	**Communication Group**	V	PE-1	BTEC-906A-18	Random Variables and Stochastic Processes	3L:0T:0P	3
8.		VI	PE-2	BTEC-906B-18	Information Theory and Coding	3L:0T:0P	3
9.		VII	PE-3	BTEC-906C-18	Antenna Radiating Systems	3L:0T:0P	3
10.		VII	PE-4	BTEC-906D-18	Mobile Communication and Networks	3L:0T:0P	3
11.		VIII	PE-5	BTEC-906E-18	Satellite Communication	3L:0T:0P	3
12.		VIII	PE-6	BTEC-906F-18			
12.	**Electronics**	V	PE-1	BTEC-907A-18	VLSI/ULSI Technology	3L:0T:0P	3

13.	**Hardware Group**	VI	PE-2	BTEC-907B-18	Embedded System Design	3L:0T:0P	3
14.		VII	PE-3	BTEC-907C-18	Robotics and Automation	3L:0T:0P	3
15.		VII	PE-4	BTEC-907D-18	VLSI Testing	3L:0T:0P	3
16.		VIII	PE-5	BTEC-907E-18	Radio Frequency Circuit Design	3L:0T:0P	3
17.		VIII	PE-6	BTEC-907F-18	Micro-electromechanical Systems	3L:0T:0P	3
18.	**Software Development Group**	V	PE-1	BTEC-908A-18	Object Oriented Programming using C++	3L:0T:0P	3
		VI	PE-2	BTEC-908B-18	Programming in JAVA	3L:0T:0P	3
19.		VII	PE-3	BTEC-908C-18	Python Programming	3L:0T:0P	3
20.		VII	PE-4	BTEC-908D-18	Machine Learning	3L:0T:0P	3
21.		VIII	PE-5	BTEC-908E-18	Open Source Development	3L:0T:0P	3
22.		VIII	PE-6	BTEC-908F-18	Soft Computing	3L:0T:0P	3
23.	**Signal processing Group**	V	PE-1	BTEC-909A-18	Speech and Audio Processing	3L:0T:0P	3
24.		VI	PE-2	BTEC-909B-18	Digital Image and Video Processing	3L:0T:0P	3
25.		VII	PE-3	BTEC-909C-18	Adaptive Signal Processing	3L:0T:0P	3
26.		VII	PE-4	BTEC-909D-18	Natural Language Processing	3L:0T:0P	3
27.		VIII	PE-5	BTEC-909E-18	Biomedical & Neuro Signal Processing	3L:0T:0P	3
		VIII	PE-6	BTEC-909F-18		3L:0T:0P	3

LIST OF OPEN ELECTIVE (OE) COURSES OFFERED BY DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING FOR STUDENTS OF OTHER PROGRAMS

Sr. No	Course Code	Sem	Course Title	L	T	P	Hours/ Week	Credits
1.	BTEC-301-18	Odd	Electronic Devices	3	0	0	3	3
2.	BTEC-302-18	Odd	Digital System Design	3	0	0	3	3
3.	BTEC-503-18	Odd	Linear Integrated Circuits	3	0	0	3	3
4.	BTEC-504-18	Odd	Control Systems	3	0	0	3	3
5.	BTEC-402-18	Even	Microprocessors and Microcontrollers	3	0	0	3	3
6.	BTEC-403-18	Even	Signals and Systems	3	0	0	3	3
7.	BTEC-602-18	Even	Digital Signal Processing	3	0	0	3	3
8.	BTEC-601-18	Even	Wireless Communication	3	0	0	3	3
9.	BTEC-907C-18	Odd	Robotics and Automation	3	0	0	3	3

MANDATORY COURSES (Non-Credit Courses)

Sr. No.	Mandatory Course	Course Code	Course Title	Hours/Week	Credits
1.	MC-1	BTMC-XXX-18	Environmental Sciences	3L:0T:0P	Nil
2.	MC-2	BTMC-YYY-18	Indian Constitution	3L:0T:0P	Nil
3.	MC-3	BTMC-ZZZ-18	Essence of Indian Traditional Knowledge	3L:0T:0P	Nil

IKGPTU HUSS Courses/Curricular Structure

Semester	L-T-P-C	Course No. & Title
1	2-1-0-3	L-101 Basic English
3	2-1-0-3	HSMC-103/HSMC-104 Foundation Course in Humanities (Development of Societies/Philosophy)
4	2-1-0-3	HSMC122-18 Universal Human Values – 2: Understanding Harmony
5-8	2-1-0-3	Humanities & Social Sciences Management Electives

List of Humanities & Social Sciences Including Management

Sr. No.	Course Code	Course Title	Hours	Credits
1.	HSMC101-18 /HSMC102-18	Foundational Course in Humanities (Development of Societies/Philosophy)	2L:10T:0P	3
2.	HSMC103-18	Education, Technology and Society	2L:10T:0P	3
3.	HSMC104-18	History of Science and Technology in India	2L:10T:0P	3
4.	HSMC105-18	Nyaya Logic Epistemology	2L:10T:0P	3
5.	HSMC106-18	Political and Economic Thought for a Humane Society	2L:10T:0P	3
6.	HSMC107-18	State, Nation Building and Politics in India	2L:10T:0P	3
7.	HSMC108-18	Psychological Process	2L:10T:0P	3
8.	HSMC109-18	Positive Psychology	2L:10T:0P	3
9.	HSMC110-18	Application of Psychology	2L:10T:0P	3
10.	HSMC111-18	Sociology, Society and Culture	2L:10T:0P	3
11.	HSMC112-18	Epochal Shift	2L:10T:0P	3
12.	HSMC113-18	Values and Ethics	2L:10T:0P	3
13.	HSMC114-18	Ethics and Holistic Life	2L:10T:0P	3
14.	HSMC115-18	Folk and Vernacular Expressive Tradition and Popular Culture	2L:10T:0P	3
15.	HSMC116-18	Universal Human Conduct	2L:10T:0P	3
16.	HSMC117-18	Gender Culture and Development	2L:10T:0P	3
17.	HSMC118-18	Introduction to Women's and Gender Studies	2L:10T:0P	3
18.	HSMC118-18	Introduction to Women's and Gender Studies	2L:10T:0P	3
19.	HSMC119-18	Advance Course in Peace Research	2L:10T:0P	3
20.	HSMC120-18	Contemporary India in Globalized Era: Challenges of Democracy and Development	2L:10T:0P	3
21.	HSMC121-18	Making Indian Culture: Epistemic Traditions, Literature and Per formative Arts	2L:10T:0P	3
22.	HSMC122-18	Universal Human Values 2: Understanding Harmony	2L:10T:0P	3
23.	HSMC123-18	Human relations at work	2L:10T:0P	3
24.	HSMC124-18	Sanskrit Bhasa	2L:10T:0P	3
25.	HSMC125-18	Language and Communication	2L:10T:0P	3

26.	HSMC126-18	Language and Linguistics	2L:10T:0P	3
27.	HSMC127-18	Understanding Society and Culture through Literature	2L:10T:0P	3
28.	HSMC128-18	Fundamentals of Linguistics	2L:10T:0P	3
29.	HSMC128-18	Fundamentals of Linguistics	2L:10T:0P	3
30.	HSMC129-18	Elements of Literature	2L:10T:0P	3
31.	HSMC130-18	Humanities and Multiple Dimensions of Ecology	2L:10T:0P	3
32.	HSMC131-18	Film Appreciation	2L:10T:0P	3
33.	HSMC(MIM-472)	Introduction to Industrial Management	2L:10T:0P	3
34.	HSMC (MIM-480)	Macro Economics	2L:10T:0P	3
35.	HSMC (MIM-578)	Quantitative Methods for Decision Making	2L:10T:0P	3
36.	HSMC (MIM-475)	Economics for Engineers	2L:10T:0P	3
37.	HSMC (MME-301)	Fundamentals of Management for Engineers	2L:10T:0P	3
38.	HSMC (MME-302)	Project Management and Entrepreneurship	2L:10T:0P	3
39.	HSMC (MME-303)	Law and Engineering	2L:10T:0P	3
40.	HSMC (MME-304)	Understanding Interpersonal Dynamics	2L:10T:0P	3

THIRD SEMESTER

B.Tech.

Electronics & Communication Engineering

Syllabus

IKGujral Punjab Technical University

Jalandhar-Kapurthala Highway, Kapurthala-144603 (PB)

BTEC-301-18	Credits	L	T	P	Int	Ext
Electronic Devices	3	3	0	0	40	60

Course Objective

This is one of the fundamental courses meant to recall concepts of semiconductor physics and understand the behaviour and working of semiconductor devices using mathematical models.

Course Outcomes

At the end of this course students will demonstrate the ability to:

1. Understand physics of semiconductors and behavior of charge carriers within semiconductors
2. Understand the working of semiconductor diodes supported with mathematical explanation.
3. Understand the working of BJT and MOSFET with their equivalent small signal models.
4. Understand the chemical processes used in fabrication of integrated circuits.

Unit 1: Semiconductor Physics

Review of quantum mechanics; electrons in periodic lattices; e-k diagrams; energy bands in intrinsic and extrinsic silicon; diffusion current; drift current; mobility and resistivity; sheet resistance; design of resistors.

Unit 2: Diodes

Generation and recombination of carriers; Poisson and continuity equation p-n junction characteristics; V-I characteristics; small signal switching models; avalanche breakdown; Zener diode; Schottky diode; light emitting diode; tunnel diode; varactor diode, solar cell, Rectifier & Regulator circuits.

Unit 3: Transistors

Bipolar junction transistor; V-I characteristics; Ebers-Moll model; Transistor Configurations - CE, CB, CC; MOS capacitor; MOSFET - Construction and Working; I-V characteristics; Depletion-type and Enhancement-type MOS.

Unit 4: Fabrication Processes

Oxidation; diffusion; ion-implantation; Annealing; photolithography; etching; chemical vapour deposition (CVD); sputtering; twin-tub CMOS process.

Recommended Books

1. G. Streetman, and S. K. Banerjee, *Solid State Electronic Devices*, Pearson.
2. D. Neamen, D. Biswas, *Semiconductor Physics and Devices*, McGraw-Hill Education
3. S. M. Sze and K. N. Kwok, *Physics of Semiconductor Devices*, John Wiley & Sons
4. C. T. Sah, *Fundamentals of solid state electronics*, World Scientific Publishing Co. Inc.

BTEC-302-18	Credits	L	T	P	Int	Ext
Digital System Design	3	3	0	0	40	60

Course Objective

This is course deals with fundamental concepts of digital electronics necessary many other courses, like embedded systems, VLSI and computer architecture, etc. to be studied in coming semesters.

Course Outcomes

At the end of this course student will demonstrate the ability to:

1. Apply concepts of Boolean algebra for handling logical expressions.
2. Understand working and realization of combinational circuits.
3. Understand working flip-flops and use them in designing of sequential circuits.
4. Understand fundamental concepts of logic families and architectural of programmable devices.
5. Use HDL programming tool for simulation of combinational & sequential circuits.

Unit 1: Boolean Algebra & Combinational Circuits

Logic gates; Boolean algebra; De Morgan's theorem, SOP & POS forms, canonical forms, Karnaugh maps up to 6 variables, binary codes, code Conversion, MSI devices like comparators; multiplexers; encoder; decoder; driver & multiplexed display; half and full adders; subtractors; serial and parallel adders; BCD adder; barrel shifter and ALU.

Unit 2: Sequential Circuits

Building blocks of sequential circuits like S-R, J-K,T & D flip-flops; master-slave J-K FF; edge triggered FF; ripple counters; synchronous counters; shift registers; finite state machines; design of synchronous FSM, algorithmic state machines charts; designing synchronous circuits like pulse train generator; pseudo random binary sequence generator; clock generation.

Unit 3: Programmable Devices & ADC and DAC

Specifications: noise margin, propagation delay, fan-in, fan-out, Tristate; TTL, ECL, CMOS families and their interfacing; architectures of PLA, PAL, GAL, CPLD&FPGA. DAC: weighted resistor, R-2R ladder, resistor string; ADC: single slope, dual slope, successive approximation, flash.

Unit 4: Introduction to VHDL

VHDL constructs; Data types and objects; different modelling styles in VHDL; Dataflow, Behavioural and Structural Modelling; Synthesis and Simulation; HDL programming for basic combinational and sequential circuits.

Recommended Books

1. R.P. Jain, *Modern digital Electronics*, Tata McGraw Hill
2. Douglas Perry, *VHDL*, Tata McGraw Hill
3. W.H. Gothmann, *Digital Electronics-An introduction to theory and practice*, PHI
4. D.V. Hall, *Digital Circuits and Systems*, Tata McGraw Hill
5. Charles Roth, *Digital System Design using VHDL*, Tata McGraw Hill

BTEC-303-18	Credits	L	T	P	Int	Ext
Electromagnetic Waves	3	3	1	0	40	60

Course Objective

This course deals with knowledge and background required for better understanding of Electromagnetic Waves and fundamentals.

Course Outcomes

At the end of this course student will demonstrate the ability to:

1. Understand characteristics & wave propagation through transmission lines
2. Understand Maxwell's equations for electromagnetic waves
3. Characterize uniform plane wave
4. Calculate reflection and transmission of waves at media interface

Unit 1: Transmission Lines

Equations of voltage and current on transmission line; propagation constant and characteristic impedance, and reflection coefficient and VSWR; Loss-less and Low-loss transmission line; Power transfer on transmission line; S-parameters, Smith chart; applications of transmission lines; impedance matching; use of transmission line sections as circuit elements.

Unit 2: Maxwell's Equations

Basics of vectors; Vector calculus; Basic laws of Electromagnetic; Maxwell's equations; Boundary conditions at media Interface.

Unit 3: Uniform Plane Wave

Uniform plane wave; propagation of wave; wave polarization; Poincare's sphere; wave propagation in conducting medium; phase and group velocity; power flow and Poynting vector; surface current and power loss in a conductor.

Unit 4: Plane Waves at a Media Interface

Plane wave in arbitrary direction; reflection and refraction at dielectric interface; total internal reflection; wave polarization at media interface; reflection from a conducting boundary.

Unit 5: Wave propagation in parallel plane waveguide

Analysis of waveguide general approach; rectangular waveguide, modal propagation in rectangular waveguide; surface currents on the waveguide walls, field visualization, attenuation in waveguide.

Recommended Books

1. RK Shevgaonkar, *Electromagnetic Waves*, Tata McGraw Hill India
2. EC Jordan & KG Balmain, *Electromagnetic waves & Radiating Systems*, PHI
3. N Rao,*Engineering Electromagnetics*, Prentice Hall
4. DCheng, *Electromagnetics*, Prentice Hall

5. W H Hayt & J A Buck,*Engineering Electromagnetics*, McGraw Hill

BTEC-304-18	Credits	L	T	P	Int	Ext
Network Theory	3	3	1	0	40	60

Course Objective

This course is meant to create mathematical foundation which can further be extrapolated to understand and analyze the electrical networks.

Course Outcomes

At the end of this course student will be able to:

1. Analyze linear networks using network theorems.
2. Use Laplace transform to analyze transient & steady state response of linear networks.
3. Comprehend network parameters to analyze two port networks.
4. Realize one port networks using Foster's and Cauer's methods.

Unit 1: Network Theorems

Node and mesh analysis; impedance matrix approach for networks analysis; Network theorems: superposition, reciprocity, Thevenin's, Norton's, Maximum power Transfer, compensation and Tallegen's theorem as applied to AC circuits; Trigonometric and Exponential Fourier series, Fourier Transform and continuous spectra Three phase unbalanced circuit and power calculation.

Unit 2: Transient & Steady State Analysis

Transient behavior, concept of complex frequency, Driving points, Poles and Zeros, Laplace transforms and properties: singularity functions, waveform synthesis; time domain analysis of RC, RL & RLC networks with and without initial conditions; Laplace Transforms for steady state and transient response of networks, quality factor.

Unit 3: Two Port Networks

Impedance parameters; admittance parameters; transmission parameters; hybrid parameters; inter-relationships between two port network parameters; interconnection of two port networks; T and Pi representation of two port networks; image impedance; characteristic impedance; propagation constant; filters: low pass, high pass; band pass, band stop & Butterworth filter.

Unit 4: Network Synthesis

Realizability criteria: Hurwitz polynomial, positive real functions; network realization using Foster's first and second forms; network synthesis using Cauer's first and second forms.

Recommended Books

1. Van, Valkenburg, *Network Analysis*, PHI
2. F F Kuo, *Network Analysis & Synthesis*, Wiley
3. A. Sudhakar, SP Shyammohan, *Circuits and Network*, Tata McGraw-Hill
4. A William Hayt, *Engineering Circuit Analysis*, McGraw-Hill Education

BTAM-303-18	Credits	L	T	P	Int	Ext
Mathematics III	4	3	1	0	40	60

Course Objective

The objective of this course is to familiarize the prospective engineers with techniques in multivariate integration, ordinary and partial differential equations and complex variables along with Probability and Correlation. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines.

Course Outcomes

The students will learn:
1. The mathematical tools needed in evaluating multiple integrals and their usage.
2. The effective mathematical tools for the solutions of differential equations that model physical processes.
3. The tools of differentiation and integration of functions of a complex variable that are used in various techniques dealing engineering problems.
4. To introduce the solution methodologies for second order Partial Differential Equations with applications in engineering
5. To provide an overview of probability and statistics to engineers

Section A

Unit 1 : Transforms Calculus-I:

Laplace Transform, Properties of Laplace Transform, Laplace Transform of Unit step function, Impulse function, Dirac-delta function, Periodic functions. Inverse Laplace Transform, convolution theorem, Evaluation of integrals by Laplace Transform, Applications to ODEs and PDEs.

Unit 2: Transforms Calculus-II:

Fourier Series, half range Fourier Sine and Cosine series, Fourier integrals, Gibbs Phenomenon, Fourier transforms, Relation between Laplace and Fourier transform, Properties of Fourier Transforms, Convolution Theorem and applications

Unit 3: Transforms Calculus-III

Basic theory of Z transforms, Translation theorem, Scaling property of Z transforms, Initial and Final value theorems, Differentiation of Z tranforms Solution of Difference equations using Z transform, Applications of Z transforms to find the sum of series

Section B

Unit 4: Probability

Conditional probability, Discrete and continuous random variables, Probability distributions: Binomial, Poisson and Normal, Poisson approximation to the binomial distribution, evaluation of statistical parameters for these three distributions.

Unit 5: Correlation and regression

Correlation and Regression for bivariate data, Rank correlation, Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance for small and large samples (z-test, t-test, F-test and Chi-square test).

Text / References:

1. E. Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, 2006.
2. R K jain and Iyengar, "Advanced Engineering Mathematics", 5th Edition, Narosa Publishing, 2017.
3. P. G. Hoel, S. C. Port and C. J. Stone, "Introduction to Probability Theory", Universal Book Stall, 2003.
4. S. Ross, "A First Course in Probability", Pearson Education India, 2002.
5. W. Feller, "An Introduction to Probability Theory and its Applications", Vol. 1, Wiley, 1968.

BTEC-311-18	Credits	L	T	P	Int	Ext
Electronic Devices Lab	1	0	0	2	30	20

Course Objective

This is basic course meant to give hands on experience of semiconductor devices and making them to use in circuits & projects.

Course Outcomes

At the end of this course student will demonstrate the ability to:

1. Realize use of diodes in circuits with proper understanding to their working.
2. Understand characteristics & working of BJT in different configurations.
3. Understand characteristics & working of MOSFET in circuits.
4. Think and design working circuits based on diodes, BJTs and MOSFETs.

Part-A: Experiments

List of Experiments

1. Study of datasheets of semiconductor devices.
2. V-I characteristics of PN junction Zener diode.

3. Zener diode as voltage regulator.
4. Half-wave rectifier.
5. Full-wave center-tapped and bridge rectifier.
6. Input & output V-I characteristic curve of npn/pnp BJT in CE configuration
7. Input & output V-I characteristic curve of npn/pnp BJT in CB configuration
8. Input & output V-I characteristic curve of npn/pnp BJT in CC configuration
9. BJTs (npn & pnp) as switches to drive a relay
10. V-I Characteristics curves of MOSFET

Part-B: Lab Projects

Every individual student is required design and build one Lab Project under the supervision of course teacher. Topic of the project may be any from the theory contents and not limited to following list:

1. Blinking linear/circular lights
2. Ambient light sensor based controller
3. Regulated dual power supply of ±5V or ±12V or mixed
4. BJT audio amplifier
5. BJT circuit for sampling of analog signal
6. Simulate any project idea using SPICE software

BTEC-311-18	Credits	L	T	P	Int	Ext
Digital System Design Lab	1	0	0	2	30	20

Course Objective

This is laboratory course meant to realize basic digital circuits using physical components and EDA tools in simulation environment.

Course Outcomes

At the end of this course student will demonstrate the ability to:

1. Realize combinational circuits using logic gates.
2. Realize sequential circuits using logic gates.
3. Write & simulate VHDL programs for combinational & sequential circuits.
4. Think and design working projects using digital 74XX ICs.

Part-A: Experiments (Any 10 Experiments)

1. To verify the Truth-tables of all logic gates.
2. To realize and verify the Half & full adder circuits using logic gates.
3. To realize Half & full subtractor circuits using logic gates.
4. To realize 4-bit binary-gray & gray-binary converters.
5. To realize comparator circuit for two binary numbers of 2-bit each.
6. To realize Full adder & full subtractor circuits using 8x3 encoder.
7. To design Full adder & full subtractor circuits using 8x3 demultiplexer.
8. To design and verify the Truth tables of all flip-flops.
9. To design Mod-6/Mod-9 synchronous up-down counter.

10. To write VHDL program for combinational & sequential circuits from S. No. 2 to 7
11. To write VHDL program for universal shift-register operations

Part-B: Lab Projects

Every individual student is required design one Lab Project under the supervision of course teacher. Topic of the project may be any from the theory contents and not limited to following list:

1. Pulse Width Modulator based LED dimmer using 555 timer IC.
2. Up-down 4-bit counter with seven-segment display.
3. Construction of combinational circuits using universal gates.
4. Bi-directional visitors counter
5. Traffic light control system
6. Any project based on Arduino platform

HSMC 101-18/HSMC 102-18	Credits	L	T	P	Int	Ext
Foundational Course in Humanities (Development of Societies or Philosophy)	3	3	0	0	40	60

The syllabus is same as in HUSS subjects given by AICTE Model Curriculu

BTEI-321-18	Credits	L	T	P	Int	Ext
4-Week Institutional Training	2	0	0	4	60	40

Four weeks training in the area of Electronics and Communication Engineering. This training should give exposure to the practical aspects of the discipline. In addition, the student may also work on a specified task or project which may be assigned to him/her.

BMPD-331-18	Credits	L	T	P	Int	Ext
Mentoring and Professional Development*	Non-credit	0	0	2	S/US**	

* As stated in the IKGPTU B.Tech 1st Year Scheme and Syllabus
**S/US - Satisfactory and Unsatisfactory

* Guidelines regarding Mentoring and Professional Development
The objective of mentoring will be development of:

- Overall Personality
- Aptitude (Technical and General)
- General Awareness (Current Affairs and GK)
- Communication Skills

- Presentation Skills

The course shall be split in two sections i.e. outdoor activities and class activities.

For achieving the above, suggestive list of activities to be conducted are:

Part – A

(Class Activities)

1. Expert and video lectures
2. Aptitude Test
3. Group Discussion
4. Quiz (General/Technical)
5. Presentations by the students
6. Team building Exercises

Part – B

(Outdoor Activities)

1. Sports/NSS/NCC
2. Society Activities of various students chapter i.e. ISTE, SCIE, SAE, CSI, Cultural Club, etc.

Evaluation shall be based on rubrics for Part – A & B

Mentors/Faculty incharges shall maintain proper record of students for each activity conducted and the same shall be submitted to the department.

FOURTH SEMESTER

B.Tech.

Electronics & Communication Engineering

Syllabus

IKGujral Punjab Technical University

Jalandhar-Kapurthala Highway, Kapurthala-144603 (PB)

BTEC-401-18	Credits	L	T	P	Int	Ext
Analog Circuits	3	3	0	0	40	60

Course Objective

This course deals design & analytical concepts of various Analog circuits like BJT/FET circuits, feedback amplifiers, oscillators, power amplifiers and DAC & ADC converters.

Course Outcomes

At the end of this course student will be able to:

1. Understand the biasing of transistors and analyze BJT/FET amplifiers
2. Analyze various rectifier and amplifier circuits
3. Analyze sinusoidal and non-sinusoidal oscillators
4. Understand the functioning of OP-AMP and design OP-AMP based circuits
5. Explain the design of ADC and DAC.

Unit 1: Diode and Transistor Amplifier Circuits

Diode Circuits, Amplifiers types: Voltage amplifier, current amplifier, trans-conductance amplifier and trans-resistance amplifier; biasing schemes for BJT and FET amplifiers; bias stability; transistor configurations: CE/CS, CB/CG, CC/CD and their features; small-signal analysis; low-frequency transistor models; amplifier analysis: current gain, voltage gain, input resistance and output resistance; amplifier design procedure; low frequency analysis of multistage amplifiers. High frequency transistor models.

Unit 2: Feedback Amplifiers

Feedback topologies: Voltage series, current series, voltage shunt and current shunt feedback; effect of feedback on gain, bandwidth, input & output impedances; concept of stability, gain margin and phase margin.

Unit 3: Oscillators

Introduction, Types of Oscillators, Barkhausen criterion, RC-phase shift, Wien bridge, Hartley, Colpitt, Clapp oscillators and non-sinusoidal oscillators.

Unit 4: Power Amplifiers

Class A, B, AB and C power amplifiers, their efficiency and distortions; frequency response: single stage, multistage amplifiers and cascade amplifier

Recommended Books

1. J Millman & A Grabel, *Microelectronics*, McGraw Hill
2. J Millman& C Halkias, *Integrated Electronics*, Tata McGraw Hill
3. A Ramakant, Gayakwad, *Op-Amps And Linear Integrated Circuits*, PHI
4. P Horowitz & W Hill, *The Art of Electronics*, Cambridge University Press
5. AS Sedra & KC Smith, *Microelectronic Circuits*, Saunder's College Publishing

BTEC-402-18	Credits	L	T	P	Int	Ext
Microprocessors and Microcontrollers	3	3	0	0	40	60

Course Objective

This is course deals with fundamental concepts of digital electronics necessary many other courses, like embedded systems, VLSI and computer architecture, etc. to be studied in coming semesters.

Course Outcomes

At the end of this course student will demonstrate the ability to:

1. Understand architecture &functionalities of different building block of 8085 microprocessor.
2. Understand working of different building blocks of 8051 microcontroller.
3. Comprehend and apply programming aspects of 8051 microcontroller.
4. Interface & interact with different peripherals and devices.

Unit 1: Microprocessor 8085

History of microprocessors; microprocessor 8085 Architecture, Pin configuration; Memory Interfacing; microprocessor programming model; 8085 instructions; Addressing modes; programming techniques, counters and time delays; stack and subroutines; interrupts.

Unit 2: Microcontroller 8051 - Building Blocks

Microprocessor vs microcontroller; RISC vs CISC architectures; microcontroller 8051: architecture, pin configuration, flag-bits and PSW register, input-output ports, register banks and stack; semiconductor memories: ROM, SRAM, DRAM, virtual memory, cache memory; memory organization.

Unit 3: Microcontroller 8051 - Programming

Assembly language programming; data types and directives; jump loop and call instructions; I/O port programming; addressing modes and accessing memory using various addressing modes; arithmetic instructions and programs; logic instructions and programs; single bit instructions and programming, 8051 interrupts; timer/counter programming in the 8051.

Unit 4: Microcontroller 8051 - Interfacing

Parallel and serial ADC& DAC interfacing; LCD interfacing, Keyboard interfacing; sensor interfacing; interfacing with external memory; matrix keypad; stepper motor interfacing; DC motor interfacing and PWM.

Recommended Books

1. R S Gaonkar, *Microprocessor Architecture, Programming and Application with 8085*, Penram International Publishing Pvt. Ltd.
2. Kenneth Ayala, *The 8051 Microcontroller*, Cengage Learning

3. Douglas Hall, *Microprocessors Interfacing*, Tata McGraw Hill
4. Subrata Ghoshal, *8051 Microcontroller: Internals, Instructions, Programming and Interfacing*, Pearson Education
5. K Uma Rao, Andhe Pallavi, *The 8051 Microcontrollers: Architecture, Programming and Applications*, Pearson Education.

BTCS-301-18	Credits	L	T	P	Int	Ext
Data Structures and Algorithms	3	3	0	0	40	60

Finalized by the concerned Board of Studies of Department of Computer Science and Engineering.

Course Objectives: The objective of the course is to impart the basic concepts of data structures and algorithms, to understand concepts about searching and sorting technique and to understand basic concepts about stacks, queues, lists, trees and graphs, data structures.

Course outcomes

Student will be able to:

1. Understand operations like searching, insertion, deletion, traversing on linear Data Structures and to determine their computational complexities
2. Understand operations like searching, insertion, deletion, traversing on various non linear Data Structures and to determine their computational complexities
3. Write algorithms for Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity.
4. Apply appropriate Data Structure as per specific problem definition

Detailed contents: Module 1:

Introduction: Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off. **Searching:** Linear Search and Binary Search Techniques and their complexity analysis.

Introduction to pointers and dynamic memory allocation, use of pointers in self referential data structures.

Module 2:

Stacks and Queues: ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis.

Module 3:

Linked Lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.

Trees: Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis, Applications of Binary Trees.

Module 4:

Sorting and Hashing: Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, Hashing.

Graph: Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.

Suggested books:

1. "Classic Data Stuructures", Samanta and Debasis, PHI publishers
2. "Fundamentals of Data Structures", Illustrated Edition by Ellis Horowitz, Sartaj Sahni, Computer Science Press.
3. "Data Structures with C (Schaum's Outline Series)",Seymour Lipschutz,Mc Graw Hill.

Suggested reference books:

1. Algorithms, Data Structures, and Problem Solving with C++", Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company
2. "How to Solve it by Computer" , 2nd Impression by R. G. Dromey, Pearson Education.
3. Algorithms by Tannenbaum

BTEC-403-18	Credits	L	T	P	Int	Ext
Signals & Systems	4	3	1	0	40	60

Course Objective: The objective of this course is to enable students to apply mathematical concepts and tool in analysis of electrical signals and systems.

Course outcomes:

At the end of this course students will demonstrate the ability to:

1. Mathematically characterize different types of signals and systems.
2. Analyze the behavior of linear-shift invariant systems.

3. Apply concepts of Fourier and Laplace Transforms to analyze continuous-time signals and systems.
4. Investigate discrete-time signals and systems using Discrete-Time Fourier and Z-Transforms and simple Probability concepts.

Unit 1: Introduction to Signals and Systems

Classification of Signals: Periodic and Aperiodic signals, continuous and discrete time signals, continuous and discrete amplitude signals; Linear and nonlinear signals, Causal and non-causal signals, Even and odd signals, Energy and power signals; System properties: linearity, shift-invariance ,causality, stability, Realizability.

Unit 2: Linear-Shift Invariant Systems

Linear shift-invariant systems; Impulse response and step response ;Convolution, Input-output behaviour with Aperiodic convergent inputs; Characterization of causality and stability of LSI systems; System representation through differential equations and difference equations; Periodic inputs to an LSI system; Notion of frequency response and its relation to the impulse response.

Unit 3: Continuous-Time Analysis of Signals and Systems

Fourier Series; Fourier Transform; Magnitude and phase response; Properties of Fourier Transform: Convolution/Multiplication, Duality, Time-shifting, Frequency-shifting, Time-scaling, Integration and differentiation in time-domain; Review of Laplace Transform for continuous-time signals and systems; Notion of Eigen functions of LSI systems; System transfer function and poles-zeros analysis; Solution to differential equations and system behaviour.

Unit 4: Discrete-Time Analysis of Signals and Systems

Sampling Theorem and its proof; Spectra of sampled signals; Aliasing and its effects; Reconstruction and its implications; Probability: Mean, median, mode and standard deviation; combinatorial probability, probability distribution functions. Discrete-Time Fourier Transform (DTFT); Discrete Fourier Transform; Parseval's Theorem; Review of Z-Transform for discrete-time signals and systems; System functions; Region of convergence and z-domain analysis, Conditional Probability.

Text/Reference books:

1. Allan V. Oppenheim, S. Wilsky and S. H. Nawab, *Signals and Systems*, Pearson Education
2. I J Nagrath, S N Sharan, R Ranjan S Kumar, *Signals and Systems*, Tata McGraw Hill
3. B.P. Lathi, Signal Processing and Linear Systems, Oxford University Press
4. S Poornachandra, B Sasikala, *Signals and Systems*, Tata McGraw Hill
5. Robert A. Gabel, Richard A. Roberts, *Signals and Linear Systems*, John Wiley and Sons.

HSMC 122-18	Credits	L	T	P	Int	Ext
Universal Human Values-2 : Understanding Harmony	3	3	0	0	40	60

The syllabus of this course is same as given in detailed HUSS group syllabus in AICTE Model Curriculum 2018.

EVS-101-18	Credits	L	T	P	Int	Total
Mandatory Course: Environmental Sciences	Non-credit	2	0	0	50	50

Finalized by the Board of Studies of Department of Civil Engineering.

Course Outcomes:

1. Students will enable to understand environmental problems at local and national level through literature and general awareness.
2. The students will gain practical knowledge by visiting wildlife areas, environmental institutes and various personalities who have done practical work on various environmental Issues.
3. The students will apply interdisciplinary approach to understand key environmental issues and critically analyze them to explore the possibilities to mitigate these problems.
4. Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world

1. Environment Science (Mandatory non-credit course)

We as human being are not an entity separate from the environment around us rather we are a constituent seamlessly integrated and co-exist with the environment around us. We are not an entity so separate from the environment that we can think of mastering and controlling it rather we must understand that each and every action of ours reflects on the environment and vice versa. Ancient wisdom drawn from Vedas about environment and its sustenance reflects these ethos. There is a direct application of this wisdom even in modern times. Idea of an activity based course on environment protection is to sensitize the students.

Detailed Contents

Module 1 : Natural Resources :Renewable and non-renewable resources

Natural resources and associated problems.

a) Forest resources : Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.

b) Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

c) Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

d) Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

e) Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.

f) Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

- Role of an individual in conservation of natural resources.
- Equitable use of resoureces for sustainable lifestyles.

Module 2 : Ecosystems

Concept of an ecosystem. Structure and function of an ecosystem.
Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of following ecosystems:

a. Forest ecosystem
b. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Module 3 : Biodiversity and its conservation

- Introduction – Definition : genetic, species and ecosystem diversity.
- Biodiversity at global, National and local levels.
- Inida as a mega-diversity nation
- Hot-sports of biodiversity.
- Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India
-

Module 4 : Social Issues and the Environment

- From Unsustainable to Sustainable development
- Resettlement and rahabilitation of people; its problems and concerns.
- Environmental ethics : Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, Nuclear accidents and holocaust. Case Studies.
- Public awareness.

***ACTIVITIES**

Nature club (bird watching, recognizing plants at institute/at home, recognizing local animals, appreciating biodiversity

Impart knowledge and inculcate the habit of taking interest and understanding biodiversity in and around the college campus. The students should be encouraged to take interest in bird watching, recognizing local plants, herbs and local animals. The students should be encouraged to appreciate the difference in the local biodiversity in their hometown, in the place of their study and other places they visit for vacation/breaks etc.

Following activities must be included.

Identify a tree fruit flower peculiar to a place or having origin from the place.

Making high resolution big photographs of small creatures (bees, spiders, ants. mosquitos etc.) especially part of body so that people can recognize (games on recognizing animals/plants).

Videography/ photography/ information collections on specialties/unique features of different types of common creatures.

Search and explore patents and rights related to animals, trees etc. Studying miracles of mechanisms of different body systems.

1*(A) Awareness Activities:*

a) Small group meetings about water management, promotion of recycle use, generation of less waste, avoiding electricity waste
b) Slogan making event
c) Poster making event
d) Cycle rally
e) Lectures from experts
f) Plantation
g) Gifting a tree to see its full growth
h) Cleanliness drive
i) Drive for segregation of waste
i) To live with some eminent environmentalist for a week or so to understand his work vi) To work in kitchen garden for mess
j) To know about the different varieties of plants
k) Shutting down the fans and ACs of the campus for an hour or so
l) Visit to a local area to document environmental assets

river/forest/grassland/hill/mountain/lake/Estuary/Wetlands

m) Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
n) Visit to a Wildlife sanctuary, National Park or Biosphere Reserve

Suggested Readings

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. BharuchaErach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India, Email:mapin@icenet.net (R)
3. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
4. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
5. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
6. Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)

7. Heywood, V.H &Waston, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.
8. Mhaskar A.K., Matter Hazardous, Techno-Science Publication (TB)
9. Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB)
10. Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA, 574p
11. Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science (TB)
12. Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Stadards, Vol I and II, Enviro Media (R)
13. Trivedi R. K. and P.K. Goel, Introduction to air pollution, Techno-Science Publication (TB)
14. Wanger K.D., 1998 Environmental Management. W.B. Saunders Co. Philadelphia, USA 499p

BTEC-411-18	Credits	L	T	P	Int	Ext
Analog Circuits Lab	1	0	0	2	30	20

Course Objective

This laboratory course deals design & analytical concepts of various analog circuits like BJT/FET circuits, feedback amplifiers, oscillators, power amplifiers and DAC & ADC converters.

Course Outcomes

At the end of this course student will demonstrate the ability to:

1. study and verify the characteristics of diodes in circuits with proper understanding to their working.
2. Understand characteristics & working of BJT in different configurations.
3. Understand characteristics & working of OP-AMPs in circuits.
4. Think and design working circuits based on diodes, BJTs and MOSFETs.

Part-A: Experiments

List of Experiments:

1.To study the Input/Output V-I characteristics of BJT in CE configuration.
2.To study Emitter follower circuit.
3. To calculate the frequency of RC phase shift oscillator.
4.To study the frequency response of Wein bridge oscillator.
5. To study the frequency response of Hartley oscillator.
6. To study the frequency response of Colpitt's oscillator.
7. To study Gain analysis of Class-A Power Amplifier
8. To study Gain analysis of Class-B Power Amplifier
9. To study Gain analysis of Class B Push-pull Power Amplifier

10. To study Gain analysis of Class-C Power Amplifier

Part-B: Lab Projects

Every individual student is required design one Lab Project under the supervision of course teacher. Topic of the project may be any from the theory contents and not limited to following list:

1. BJT audio amplifier
2. Op-Amp based square and triangular waveform generator
3. Any project based on IoT/Arduino platform

BTEC-411-18	Credits	L	T	P	Int	Ext
Microprocessors and Microcontrollers Lab	1	0	0	2	30	20

Course Objective

This is laboratory course meant to realize basic digital circuits using physical components and EDA tools in simulation environment.

Course Outcomes

At the end of this Lab course student will be able to:

1. Realize combinational circuits using logic gates.
2. Realize sequential circuits using logic gates.
3. Write & simulate VHDL programs for combinational & sequential circuits.
4. Think and design working projects using digital 74XX ICs.

Part-A: Write programs in Assembly language & embedded C to

1. Add two 8-bit numbers stored in registers or internal/External memory locations.
2. Multiply two 8-bit numbers.
3. Multiply two 16-bit numbers.
4. Transfer block of data from internal memory locations to external memory locations
5. Sort block of data in ascending or descending order.
6. Generate 5KHz pulse waveform of 50% duty cycle.
7. Interface ADC and DAC.
8. Interface Matrix Keyboard.
9. Interface LCD Displays.
10. Interface Stepper Motor.
11. Control DC motor using PWM.

Part-B: Lab Projects

Every individual student is required design one Lab Project under the supervision of course teacher. Topic of the project may be any from the theory contents and not limited to following list:

1. RFID attendance system
2. Home automation

3. Robotic vehicle
4. Sensor traffic lights
5. Floor cleaning robot
6. Robot for defense applications
7. GPS vehicle tracking
8. Accident identification and SMS

BMPD-341-18	Credits	L	T	P	Int	Ext
Mentoring and Professional Development*	Non-credit	0	0	2	S/US**	

* As stated in the IKGPTU B.Tech 1st Year Scheme and Syllabus
**S/US - Satisfactory and Unsatisfactory

* Guidelines regarding Mentoring and Professional Development
The objective of mentoring will be development of:
- Overall Personality
- Aptitude (Technical and General)
- General Awareness (Current Affairs and GK)
- Communication Skills
- Presentation Skills

The course shall be split in two sections i.e. outdoor activities and class activities.
For achieving the above, suggestive list of activities to be conducted are:

Part – A
(Class Activities)

1. Expert and video lectures
2. Aptitude Test
3. Group Discussion
4. Quiz (General/Technical)
5. Presentations by the students
6. Team building Exercises

Part – B
(Outdoor Activities)

1. Sports/NSS/NCC
2. Society Activities of various students chapter i.e. ISTE, SCIE, SAE, CSI, Cultural Club, etc.

Evaluation shall be based on rubrics for Part – A & B
Mentors/Faculty incharges shall maintain proper record student wise of each activity conducted
and the same shall be submitted to the department.

FIFTH SEMESTER

B.Tech.

Electronics & Communication Engineering

Syllabus

IKGujral Punjab Technical University

Jalandhar-Kapurthala Highway, Kapurthala-144603 (PB)

BTEC-501-18	Credits	L	T	P	Int	Ext
Analog and Digital Communication	3	3	0	0	40	60

Course Objective

This is one of the fundamental courses meant to know the concepts of Analog as well as Digital Communication and understand the working of common communication techniques.

Course Outcomes

At the end of this course students will demonstrate the ability to:

1. Analyze and compare different analog modulation schemes for their efficiency and bandwidth
2. Analyze the behavior of a communication system in presence of noise
3. Investigate pulsed modulation system and analyze their system performance
4. Analyze different digital modulation schemes and can compute the bit error performance

Unit 1: Analog Communication

Review of Signals and Systems, Frequency domain representation of signals, Amplitude Modulation: Transmission and Reception of DSB, SSB and VSB,Angle Modulation, Spectral characteristics of angle modulated signals, Principles of Frequency and Pulse Modulation, Representation of FM and PM signals, Review of white noise characteristics, Noise in amplitude modulation and Angle Modulation systems, Pre-emphasis and De emphasis.

Unit 2:Digital Communication

Analog to Digital: Need, Sampling process, Pulse Amplitude modulation and Concept of Time division multiplexing, Pulse code modulation (PCM), Differential pulse code modulation. Delta modulation and demodulation, Adaptive and Sigma Delta Modulation, Noise considerations in PCM, Digital Multiplexers.

Unit 3: Elements of Detection Theory

Optimum detection of signals in noise, Coherent communication with waveforms- Probability of Error evaluations. Review of probability and random process Gaussian noise characteristics, Baseband Pulse Transmission: Inter symbol Interference and Nyquist criterion.

Unit 4: Digital Modulation Techniques

Phase Shift Keying, Frequency Shift Keying, Quadrature Amplitude Modulation, Continuous Phase Modulation and Minimum Shift Keying.

Recommended Books

1. Haykin S., "Communications Systems", John Wiley and Sons, 2001.
2. Proakis J. G. and Salehi M., "Communication Systems Engineering", Pearson Education, 2002.
3. Taub H. and Schilling D.L., "Principles of Communication Systems", Tata McGraw Hill, 2001.
4. Wozencraft J. M. and Jacobs I. M., ``Principles of Communication Engineering",John Wiley, 1965.
5. Barry J. R., Lee E. A. and Messerschmitt D. G., ``Digital Communication", Kluwer Academic Publishers, 2004.
6. Proakis J.G., ``Digital Communications", 4th Edition, McGraw Hill, 2000.

BTEC-502-18	Credits	L	T	P	Int	Ext
Digital Signal Processing	4	3	1	0	40	60

Course Objective

This is one of the fundamental courses meant to know the concepts of Digital Signal Processing and understand the commonly used digital filters and systems.

Course Outcomes

At the end of this course students will demonstrate the ability to

1. Represent signals mathematically in continuous and discrete time and frequency domain
2. Get the response of an LSI system to different signals
3. Design of different types of digital filters for various applications

Unit 1: Discrete Time Signals

Elementary Discrete time sequences and systems; Representation of signals on orthogonal basis; Sampling and reconstruction of signals; Discrete systems attributes, Basic elements of digital signal processing such as convolution, correlation and autocorrelation, Concepts of stability, causality, linearity, difference equations. Implementation of Discrete Time Systems, Linear Periodic and Circular convolution, Z-Transform, Inverse Z-Transform methods, Properties of Z-Transform.

Unit 2: LSI Systems

Analysis of LSI systems, Frequency Analysis, Inverse Systems, Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT) with their properties, Inverse DFT and FFT methods, Goertzel Algorithm.

Unit 3: Digital filtersDesign

Structures of realization of discrete time system, direct form, Cascade form, parallel form and lattice structure of FIR and IIR systems. Time Invariant and Bilinear Transformation Methods,Rectangular,Hamming and Hanning Window methods, Park-McClellan's method. Design of IIR Digital Filters: Butterworth, Chebyshev and Elliptic Approximations; Low pass, Band pass, Band stop and High pass filters. Effect of finite register length in FIR filter design. Parametric and non-parametric spectral estimation. Matched Z-Transformation, Analog and Digital Transformation in the Frequency Domain. Finite Precision Effects**:** Fixed point and Floating point representations, Effect of round off noise in digital filters, Limit cycles.

Unit 4: Introduction to Multirate signal processing and DSP processors

Concepts of Multirate Signal Processing, need and significance, Applications of DSP,Limitations of Analog signal processing, Advantages of Digital signalprocessing, Architectures of ADSP and TMS (C6XXX) series of processor.

Recommended Books

1. S.K.Mitra, Digital Signal Processing: A computer based approach.TMH, 2001.
2. A.V. Oppenheim and Schafer, Discrete Time Signal Processing, Prentice Hall, 1989.

3. John G. Proakis and D.G. Manolakis, Digital Signal Processing: Principles, Algorithms And Applications, Prentice Hall, 1997.
4. L.R. Rabiner and B. Gold, Theory and Application of Digital Signal Processing, Prentice Hall, 1992.
5. J.R. Johnson, Introduction to Digital Signal Processing, Prentice Hall, 1992.
6. D.J.DeFatta, J. G. Lucas andW.S.Hodgkiss, Digital Signal Processing, John Wiley& Sons, 1988.

BTEC-503-18	Credits	L	T	P	Int	Ext
Linear Integrated Circuits	3	3	0	0	40	60

Course Objective

This is one of the fundamental courses meant to know the concepts of Linear Integrated Circuits and their working along with their applications.

Course Outcomes

At the end of this course students will demonstrate the ability to:

1. Understand Differential and Cascade Amplifiers
2. Know the basics, working and characteristics of Op-Amps
3. Investigate various applications of Op-amps
4. Understand some specialized Op-Amps
5. Interpretation of Data Sheets and their Applications thereof.

UNIT I: DIFFERENTIAL ANDCASCADE AMPLIFIERS

Introduction: Differential Amplifier, its Circuit Configuration, Dual Input-Balanced output Differential amplifier, Dual Input Unbalanced output, Single Input Balanced & Unbalanced Output Differential Amplifier, Amplifier with their DC and AC analysis, Differential Amplifier with Swaping resistors, Constant current bias, Current Mirror, Cascaded differential amplifier stages, Level Translator, CE-CB Configuration.

UNIT II: INTRODUCTION TO OPERATIONAL AMPLIFIERS

Block diagram of a typicalOp-Amp, Schematic symbol, integrated circuits and their types, IC package types, Pin Identification and temperature range, Interpretation of Data sheets, Overview of typical set of data sheets, Characteristics and performance parameters of and Op-Amp, Ideal Op-Amp, Equivalent circuit of an Op-Amp, Ideal voltage transfer curve, Open loop configurations: Differential, Inverting & Non Inverting. Practical Op-Amp: Input offset voltage, Input bias current, Input offset current, total output offset voltage, Thermal drift, Effect of variation in power supply voltages on offset voltage, Temperature and supply voltage sensitive parameters, Noise, Common Mode configuration and common mode rejection Ratio. Feedback configurations.

UNIT III: APLICATIONS OF OP-AMP

DC and AC amplifiers, Peaking Amp, Summing,Scaling and Averaging Amp, Instrumentation Amplifier, Log and Antilog Amp, Integrator, Differentiator. Active filters: First order LP Butterworth filter, Second order LP Butterworth filter, First order HP Butterworth filter, Second-order HP Butterworth filter, Higher order filters, Band Pass filter, Band reject Filter, All Pass filter, Phase shift Oscillator, Wein Bridge Oscillator, Square wave Oscillator, Basic Comparator, Schmitt trigger, V to F and F to V converters.

UNIT IV: SPECIALIZED IC APPLICATIONS

IC 555 Timer: Pin configuration, Blockdiagram, application of IC 555 as Monostable and AstableMultivibrator., Phase Lock Loops: Operating principles & applications of IC 565 and IC 566,Monolithic PLL TL082, Voltage Regulators: Fixed voltage regulators (78XX and 79XX), Adjustable voltage regulators (LM327), Analog multiplier ICs (MPY634 KP) and their applications, Switching Regulators, Audio Power amplifier, Video Amplifier, Isolation Amplifier, Opto-couplers and fibre optic IC.

Recommended Books

1. 1. Op Amps & Linear Integrated circuits by Ramakant A. Gayakwad, Pearson
2. Operational Amplifiers & Linear Integrated circuits by Robert F. Coughlin, Prentice Hall
3. Design with Operational Amplifiers and Analog Integrated Circuits, Sergio Franco, TMH

BTEC-504-18	Credits	L	T	P	Int	Ext
Control Systems	4	3	1	0	40	60

Course Objective

This is the course meant to gain the knowledge ofimportant control systems, characterize them and study their state behaviour.

Course Outcomes

At the end of this course students will demonstrate the ability to

1. Characterize a system and find its study state behaviour
2. Investigate stability of a system using different tests
3. Design various controllers
4. Solve liner, non-liner and optimal control problems

Unit 1: Introduction

Classification with understanding of Industrial Control system examples. Transfer function. System with dead-time. System response. Control hardware and their models: potentiometers, synchros, LVDT, DC and AC servomotors, Tacho generators, Electro hydraulic valves, hydraulic servomotors, electro pneumatic valves, pneumatic actuators. Closed-loop systems. Block diagram and signal flow graph analysis.

Unit 2: Feedback Control systems

Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness. proportional, integral and derivative systems. Feed forward and multi-loop control configurations, stability concept, relative stability, Routh stability criterion.

Unit 3: Second Order systems

Time response of second-order systems, steady-state errors and error constants. Performance specifications in time-domain. Root locus method of design. Lead and lag compensation.

Frequency-response analysis- Polar plots, Bode plot, stability in frequency domain, Nyquist plots. Nyquist stability criterion. Performance specifications in frequency-domain. Frequency domain methods of design, Compensation & their realization in time & frequency domain. Lead and Lag compensation. Op-amp based and digital implementation of compensators. Tuning of process controllers. State variable formulation and solution.

Unit 4: State variable Analysis

Concepts of state, state variable, state model, state models for linear continuous time functions, diagonalization of transfer function, solution of state equations, concept of controllability & observability. Introduction to Optimal control & Nonlinear control, Optimal Control problem, Regulator problem, Output regulator, tracking problem. Nonlinear system – Basic concept & analysis.

Recommended Books:

1. Gopal. M., "Control Systems: Principles and Design", Tata McGraw-Hill, 1997.
2. Kuo, B.C., "Automatic Control System", Prentice Hall, sixth edition, 1993.
3. Ogata, K., " Modern Control Engineering" , Prentice Hall, second edition, 1991.
4. Nagrath& Gopal, "Modern Control Engineering", New Age International, New Delhi.

Professional Electives of ICT Group

BTEC-905A-18	Credits	L	T	P	Int	Ext
Routing and Switching	3	3	0	0	40	60

Course Outcomes

- Demonstrate a basic understanding of small and medium-sized networks, including general network technologies.
- Ability to assist the design of small and medium-sized networks, and implement the designs.
- Ability to construct simple networks and integrate voice, wireless, cloud, security, and storage technologies into their networks in order to support a variety of applications.

Network Fundamentals

Basics of network architecture, enterprise network constructs, Ethernet framing, IP addressing, Internet Control Message Protocol, Address Resolution Protocol, Transport Layer Protocols, Data Forwarding Scenario. Expanding the Enterprise Network, Navigating the CLI, File System Navigation and Management, VRP Operating System Image Management.

Network Connections

Establishing a Single Switched Network, Spanning Tree Protocol, Rapid Spanning Tree Protocol, Segmenting the IP Network, IP Static Routes, Distance Vector Routing with RIP, Link State Routing with OSPF, DHCP, FTP and Telnet Protocols, Simple Network Management Protocol, Introducing IPv6 Networks, IPv6 Routing Technologies, IPv6 Application Services

Network Construction

Link Aggregation, VLAN Principles, GARP and GVRP, VLAN Routing, Wireless LAN Overview, Bridging Enterprise Networks with Serial WAN Technology, Frame Relay Principles, Establishing DSL/ADSL Networks with PPPoE, Network Address Translation, Establishing Enterprise Radio Access Network Solutions.

Network Security

Access Control Lists, Authentication, Authorization and Accounting (AAA), Securing Data with IPsec and VPN, Generic Routing Encapsulation.

Recommended Books:

1. Computer Networks by Andrew S. Tanenbaum, David J. Wetherall, Pearson
2. https://ilearningx.huawei.com/portal/#/courses/course-v1:HuaweiX+EBGTC00000030+2018.7/about

BTEC-905B-18	Credits	L	T	P	Int	Ext
WLAN & Security	3	3	0	0	40	60

Course Outcomes:

- Demonstrate the basic understanding of small and medium-sized WLANs.
- Ability to assist the design of small and medium-sized WLANs.
- Implement the designs using wireless controllers and AP devices.

WLAN Basics

WLAN History, WLAN Standards Organizations, Wireless Radios Introduction, WLAN Frequency Bands, WLAN Product Introduction, VRP Introduction and Basic Configuration.

WLAN Networking

802.11 Physical Layer Technologies, 802.11 Protocols Introduction, Control and Provisioning of Wireless Access Points (CAPWAP) Fundamentals, CAPWAP Protocol and WLAN Topologies, WLAN Networking, WLAN Network Configuration CLI, Fast Configure WLAN Service(Web).

WLAN Product Features and Security Configuration

Features of WLAN Products, WLAN Roaming, WLAN Security, WLAN Access, Security and Configurations, . Network attack – passive/active, types, symptoms, etc.

WLAN Advanced Technology and Antenna

802.11 MAC Architecture, 802.11 Medium Access Control, Antenna Technologies, antenna design- advantages, disadvantages, area of usage, etc

WLAN Planning Basis and Troubleshooting

Introduction to Functions and WLAN Configuration, WLAN Routine Maintenance, WLAN basic Network Planning, WLAN Design and Typical Cases, Introduction to WLAN Planner, WLAN Troubleshooting, WLAN Troubleshooting Cases. Introduction to any one open source network management tool viz. esight, Net2Plan, cacti, Nagios etc.

Recommended Resources:

1. Vijay Garg , "Wireless Communications and networking", First Edition, Elsevier 2007
2. https://ilearningx.huawei.com/portal/#/courses/HuaweiX+EBGTC00000105/about

BTEC-905C-18	Credits	L	T	P	Int	Ext
Cloud Computing and Services	3	3	0	0	40	60

Course Outcomes

- Analyse the fundamentals of cloud computing technologies and applications
- Cloud computing characteristics and service attributes for compliance with enterprise objectives
- Manage the cloud and understand the security prospective involved in protecting against breaches
- Examine the emerging areas of cloud computing and its relation with traditional model of commuting

Cloud computing concepts

Traditional models of computing, Introduction to virtualization and its types, Cloud interoperability standards, concept of VLAN, VSAN and benefits, Concepts of cloud computing, applications and characteristics of cloud computing, Hypervisors, Multitenancy, Types of tenancy, Application programming interfaces (API) in cloud.

Understanding Cloud Architecture and Services

Exploring the cloud computing stack, connecting to cloud, Cloud services, Cloud service model architectures, Infrastructure as a service (IaaS), Platform as a service (PaaS), Software as a service (SaaS), Identity as a Service (IaaS), Compliance as a Service (CaaS), Web Services, Service oriented Architecture (SOA), Service Level Agreement (SLA).

Cloud migration & deployment scenarios

Cloud deployment models, Public clouds, Private clouds, Hybrid clouds, Community clouds, Virtual private clouds (VPC), Migration paths for cloud, Selection criteria for cloud deployment, Cloud economics.

Security in Cloud computing
Introduction to Security, Types of Security Attacks, Cloud security reference model, understanding security risks, Principal security dangers to cloud computing, Internal security breaches, Data corruption or loss, User account and service hijacking, steps to reduce cloud security breaches, Identity management: Detection and forensics, Benefits of identity.

Case Studies
IBM Smart Cloud, Amazon Web Services, Google Cloud platform, Windows Azure platform, Open Stack, A comparison of cloud computing platforms.

Suggested Readings/Books:

1. Barrie Sosinsky, Cloud Computing Bible, Wiley, 2011.
2. Raj Kumar Buyya, James Broberg, AndrezeiM.Goscinski, Cloud Computing: Principles and paradigms, 2011
3. Michael Miller, Cloud Computing, 2008.
4. Anthony T. Velte, Toby J. Velte and Robert Elsenpeter, Cloud Computing: A practical Approach, McGraw Hill, 2010.
5. Rishabh Sharma, Cloud Computing (Fundamentals, Industry approach and trends), Wiley

BTEC-905D-18	Credits	L	T	P	Int	Ext
Artificial intelligence	3	3	0	0	40	60

Course Outcomes:
1. Apply the concepts of knowledge representation, planning and reasoning for real world applications.
2. Demonstrate the knowledge of probability theory, python programming and Tensor flow programming
3. Ability to apply AI techniques to solve complex problems using machine learning.

Introduction to Artificial Intelligence
Foundations of artificial intelligence (AI), The Past, Present, and Future of AI, Justice and Equity in the Era of AI, Human-Machine Relationship in the Era of AI, Strategic Planning of AI in the World, AI Governance and AI Society in the Future.

Basics of Python Programming
Introduction to Python, Lists and Tuples, Strings, Dictionaries, Conditional and Loop Statements, Functions, Object-Oriented Programming, Date and Time, Regular Expressions, File Manipulation.

Introduction to Probability Theory and Statistics
Propositional Logic, Predicate Logic, Knowledge Representation, Conditional and Partial Planning, Probability Theory and Information Theory: Random Variables, Probability Distribution, Marginal and Conditional Probability, Independence and Conditional

Independence, Expectation, Variance, and Covariance, Bayesian Rules, Continuous Variable, Information Theory, Statistical data analysis –Summary Statistics, Correlation and Regression

TensorFlow Overview

Characteristics, Basics, Modules of TensorFlow, Development Environment Setup and its Steps Using TensorFlow: Defining the Tensor Flow Input Node**,** Learning Parameter Variable**,** Operation**,** Optimizing Functions and Objectives**,** Initializing All Variables, Iterate and Update Parameters to the Optimal Solution**,** Testing and using the Model.

Machine Learning

- Categories of ML, Propaedeutics of Deep Learning, Types of learning: Supervised, SemiSupervised, Unsupervised, Reinforcement. Supervised Learning Models, Regression, Classification, Clustering, Naive Bayes, Support Vector Machines, Decision Trees, K-nearest Neighbours, Machine Learning Evaluation Metrics, Cross Validation
- Overview of Deep Learning : Definition and Development of Neural Networks, Perceptron and Training Rules, Activation Functions, Types of Neural Networks, Regularization in Deep Learning, Optimizer, genetic algorithms: Selection, Crossover and Mutation, Fuzzy logic, Applications of Deep Learning.

Suggested/ Readings and Books:

1. Artificial Intelligence – A Modern Approach, Stuart Russell and Peter Norvig,Pearson Education Press,2001.
2. Artificial Intelligence ,Kevin Knight, Elaine Rich, B. Nair, , McGraw Hill, 2008.
3. Artificial Intelligence, George F. Luger, Pearson Education, 2001.
4. Exploring Python, Timothy Budd, Mc Graw Hill, 2010.
5. Deep Learning with Tensor Flow, Explore neural networks and build intelligent systems with Python, Giancarlo Zaccone, Md. RezaulKarim ,Packt Publishing Limited, 2nd Edition, 2018.

BTEC-905E-18	Credits	L	T	P	Int	Ext
Introduction to Big Data	3	3	0	0	40	60

Course Outcomes:

1. Identify Big Data and its Business Implications.
2. List the components of Hadoop and Hadoop Eco-System
3. Access and Process Data on Distributed File System
4. Manage Job Execution in Hadoop Environment

Introduction

Types of Digital Data, Introduction to Big Data, Big Data Analytics, Big Data architecture, Big Data Applications, Introduction to Hadoop, Hadoop Framework, HDFS (Hadoop Distributed File System), Master-Slave Architecture, Types of files in HDFS

Map Reduce

Map Reduce: Introduction, MapReduce Overview, MapReduce Framework and Programming Model, Sample MapReduce Application (Wordcount), MapReduce Jobs Execution

Hadoop Eco System

- Pig: Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators.
- Hive: Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions.
- YARN: YARN Architecture, Working of YARN, YARN Schedulers, Backward Compatibility withYARN, YARN Configurations, YARN Commands, YARN Containers.

NOSQL Databases

Introduction, RDMS vs NoSQL. Types of NoSQL Databases, Schema-Less Databases, Materialized Views, Distribution Models, Introduction to HBASE, Cassandra, ManoDB

Data Insight with KAFKA

Introduction, Messaging Systems, Apache Kafka, Kafka Architecture, Apache ZooKeeper

Storage System Structure & Protocols

Storage definition and development history, Introduction to Storage ecosystem, Storage System Architecture, Storage components, RAID, Storage product introduction, SAN storage protocols, NAS Storage Protocols

Suggested/ Readings and Books:

1. Artificial Intelligence – A Modern Approach, Stuart Russell and Peter Norvig,Pearson Education Press,2001.
2. Artificial Intelligence ,Kevin Knight, Elaine Rich, B. Nair, , McGraw Hill, 2008.
3. Artificial Intelligence, George F. Luger, Pearson Education, 2001.
4. Exploring Python, Timothy Budd, Mc Graw Hill, 2010.
5. Deep Learning with Tensor Flow, Explore neural networks and build intelligent systems with Python, Giancarlo Zaccone, Md. RezaulKarim ,Packt Publishing Limited, 2nd Edition, 2018.

BTEC-905F-18	Credits	L	T	P	Int	Ext
IoT and Applications	3	3	0	0	40	60

Course Outcomes

- Understand the vision and application of IoT..
- Use of Devices, Gateways and Data Management in IoT.
- Building state of the art architecture in IoT.
- Smart Applications of IoT

IoT & Web Technology

Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs.

M2M to IoT

Introduction, Machine-to-Machine (M2M) Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies.

IoT Architecture

Introduction, Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model, IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.

IoT Applications for Value Creations

Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications: Home automation, Industry applications, Surveillance applications, Other IoT applications.

Internet of Things Privacy, Security and Governance

Introduction, Overview of Governance, Privacy and Security Issues, Security, Privacy and Trust in IoT-Data-Platforms, Data Aggregation for the IoT.

Reference Books:

1. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1 st Edition, VPT, 2014
2. Francis da Costa, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1 st Edition, Apress Publications, 2013
3. Cuno Pfister, Getting Started with the Internet of Things, O"Reilly Media, 2011, ISBN: 978-1-4493- 9357-1

BTEC-511-18	Credits	L	T	P	Int	Ext
Analog and Digital Communication Laboratory	1	0	0	2	30	20

Course Objective

This laboratory course deals with the Hands-on experiments related to the study and investigate the outputs of various Analog and digital modulation techniques.

Course Outcomes

At the end of this course student will demonstrate the ability to:

1. study and verify the characteristics and output waveforms of AM, FM, PCM
2. study and compare noise in AM and FM systems
3. investigate the output responses of PAM, PCM, PSK, FSK, MSK.

List of Experiments:

1.To study the Characteristics/output waveform of Amplitude Modulation and demodulation techniques.

2. To Investigate and compare the outputs of SSB, DSB-SC and VSB Modulation systems.

3. To study and compare Noise Interference in AM and FM systems.

4.To study the effect of threshold in Angle modulation.

5. To study the effect of Sampling and Investigate the Output response of Pulse Amplitude Modulation.

6. To Investigate the Output response of Pulse Code Modulation.

7. To Study the output response of PSK & FSK.

8. To Study Delta modulation and demodulation technique and observe effect of slope overload.

9. To study the output response of QAM.

10. To study the output response of Continuous Phase Modulation.

11. To study the output response of Minimum Shift keying.

12. Digital link simulation; error introduction & error estimation in a digital link using MATLAB (SIMULINK)/ communication simulation packages.

BTEC-512-18	Credits	L	T	P	Int	Ext
Digital Signal Processing Laboratory	1	0	0	2	30	20

Course Objective

This laboratory course deals with the Hands-on experiments related to the study of Digital Signal Processing and its applications.

Course Outcomes

At the end of this course student will demonstrate the ability to:
1. Write programs to develop various signals.
2. Write programs to generate standard sequences.
3. Develop programs to verify convolution
4. Develop programs to design various filters.

List of Experiments:
Perform the following exercises using MATLAB

1. To develop elementary signal function modules (m-files) for unit sample, unit step, exponential and unit ramp sequences.
2. Write a program in MATLAB to generate standard sequences.
3. Write a program in MATLAB to compute power density spectrum of a sequence.
4. To develop program modules based on operation on sequences like signal Shifting, signal folding, signal addition and signal multiplication.
5. To develop program for finding magnitude and phase response of LTI system described by system function H(z).
6. To write a MATLAB programs for pole-zero plot, amplitude, phase response and impulse response from the given transfer function of a discrete-time causal system.

List of Lab Experiments on hardware:(using C6xxx board ,Code composer studio and Acarya app)

7. Implementation Linear and Circular Convolution
8. To Find DFT and IDFT of given time DT Signal
9. N point FFT Algorithm implementation
10. Digital Filter Design - FIR Filter Implementation
11. Digital Filter Design - IIR Filter Implementation
12. Configuring Audio Codec of C6xxx Boards
13. Configuration of Audio Input and Output Channels (Loopback/Talkback using Acarya Application)
14. Implementation of Audio Delay Line, Echo and Audio Reverberation
15. Applications - Digital Signal Generations
16. Moving Average filter Design (Noise Cancellation using Acarya Application Reference)

BTEC-513-18	Credits	L	T	P	Int	Ext
Linear Integrated Circuits Laboratory	1	0	0	2	30	20

Course Objective

This laboratory course deals with the Hands-on experiments related to the study of the concepts of Linear Integrated Circuits.

Course Outcomes

At the end of this course student will demonstrate the ability to:

1. study and investigate the configurations of Differential amplifiers.
2. measure the performance parameters of am OP-Amp.
3. use Op-Amps for various applications.

List of Experiments (Minimum 12 experiments to be performed):

1. Study differential amplifier configurations.
2. Measure the performance parameters of an Op amp.
3. Application of Op amp as Inverting and Non Inverting amplifier.
4. Study frequency response of an Op Amp and determine Gain-Bandwidth product
5. Application of Op-Amp as summing, scaling & averaging amplifier.
6. Application of Op-Amp as Instrumentation amplifier
7. Design differentiator and Integrator using Op-Amp.
8. Design Low pass, High pass and Band pass 1st order Butterworth active filters using Op-amp
9. Design Phase shift and Wein Bridge oscillator using Op-Amp.
10. Application of Op Amp as square wave, triangular wave and Sawtooth wave generator.
11. Application of Op Amp as Zero Crossing detector and window detector.
12. Application of Op Amp as Schmitt Trigger.
13. Application of 555 as Monostable and Astable multivibrator.
14. Examine the operation of a PLL and determine the free running frequency, the capture range and the lock in range of PLL.

BTEI-521-18	Credits	L	T	P	Int	Ext
4-Week Industrial Training I	3	0	0	6	60	40

Minimum of four weeks in an Industry in the area of Electronics and Communication Engineering at the end of 4th Semester. The summer internship should give exposure to the practical aspects of the discipline. In addition, the student may also work on a specified task or project which may be assigned to the student. The outcome of the internship should be

presented in the presence of the Peers and Faculty with a Power point Presentation and submit the hard copy report duly endorsed by the Industry for Evaluation to the Department. A Viva-voce will be conducted.

BMPD-351-18	Credits	L	T	P	Int	Ext
Mentoring and Professional Development*	Non-credit	0	0	2	S/US**	

* As stated in the IKGPTU B.Tech 1st Year Scheme and Syllabus
**S/US - Satisfactory and Unsatisfactory

* Guidelines regarding Mentoring and Professional Development
The objective of mentoring will be development of:
- Overall Personality
- Aptitude (Technical and General)
- General Awareness (Current Affairs and GK)
- Communication Skills
- Presentation Skills

The course shall be split in two sections i.e. outdoor activities and class activities.
For achieving the above, suggestive list of activities to be conducted are:

Part – A
(Class Activities)

1. Expert and video lectures
2. Aptitude Test
3. Group Discussion
4. Quiz (General/Technical)
5. Presentations by the students
6. Team building Exercises

Part – B
(Outdoor Activities)

1. Sports/NSS/NCC
2. Society Activities of various students chapter i.e. ISTE, SCIE, SAE, CSI, Cultural Club, etc.

Evaluation shall be based on rubrics for Part – A & B
Mentors/Faculty incharges shall maintain proper record student wise of each activity conducted
and the same shall be submitted to the department.