



IKG Punjab Technical University

Syllabus (3rd-8th Semester)

for

Undergraduate Degree Programme

Bachelor of Technology

**ELECTRONICS AND
TELECOMMUNICATION ENGINEERING**

Scheme & Syllabus

2018 & onwards

Structure of Distribution of credits Electronics & Telecommunication 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 relevent 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.*

Study Scheme and Syllabus of B.Tech.Electronics & Telecommunication Engineering: Year 2018 & Onwards

Semester III [Second year]										
Branch/Course: Electronics and Telecommunication 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	4	60	40	100	2
10	BMPD-331-18	Mentoring and Professional Development	0	0	2	Satisfactory/Un-satisfactory			Non-credit	
Total			18	3	10	29	360	440	800	25

Semester IV [Second year]										
Branch/Course: Electronics and Telecommunication 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	4
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-201-18	Mandatory Course- Environmental Sciences	3	0	0	3	40	60	100	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			18	2	6	24	300	400	700	20

Semester V [Third year]										
Branch/Course: Electronics and Telecommunication Engineering										
Sr. No.	Course code	Course Title	L	T	P	Hrs.	Internal Marks	External Marks	Total	Credits
1	BTEC-501-18	Analog and Digital Communication	3	0	0	3	40	60	100	3
2	BTEC-502-18	Digital Signal Processing	3	1	0	4	40	60	100	4
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-XXX-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-Week Industrial Training-I	0	0	6	6	60	40	100	3
11	BMPD-351-18	Mentoring and Professional Development	0	0	2	Satisfactory/Un-satisfactory				Non-credit
Total			18	2	14	32	390	460	850	26

Semester VI [Third year]											
Branch/Course: Electronics and Telecommunication 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	BTCS-ZZZ-18	Computer Networks	3	0	0	3	40	60	100	3	
3	BTEC-602-18	Optical Fibers & Communication	3	0	0	3	40	60	100	3	
4	BTEC-603-18	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-YYY-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	
10	BMPD-361-18	Mentoring and Professional Development	0	0	2	Satisfactory/Un-satisfactory			Non-credit		
Total			18	0	10	26	330	420	750	22	

Semester VII [Fourth year]											
Branch/Course: Electronics and Telecommunication Engineering											
Sr. No.	Course code	Course Title	L	T	P	Hrs	Internal Marks	External 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-ZZ3-18	Open Elective-3	3	0	0	3	40	60	100	3	
4	BTOE-ZZ4-18	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	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 Telecommunication 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	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)							2500	3150	5750	170

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

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

Sr. No.	Semester	Professiona I Elective	Course Code	Course Title	Hrs/week	Credits
1.	V	PE-1	BTEC-901A-18	Web Technologies	3L:0T:0P	3
2.	V	PE-1	BTEC-901B-18	Random Variables and Stochastic processes	3L:0T:0P	3
3.	V	PE-1	BTEC-901C-18	Embedded C Programming	3L:0T:0P	3
4.	V	PE-1	BTEC-901D-18	Digital Image and Video Processing	3L:0T:0P	3
5.	V	PE-1	BTEC-901E-18	Consumer Electronics	3L:0T:0P	3
6.	VI	PE-1	BTEC-901F-18	Pulse Wave shaping and Switching	3L:0T:0P	3
7.	VI	PE-2	BTEC-902A-18	Information Coding and Coding	3L:0T:0P	3
8.	VI	PE-2	BTEC-902B-18	CMOS Design	3L:0T:0P	3
9.	VI	PE-2	BTEC-902C-18	Display Technologies	3L:0T:0P	3
10.	VI	PE-2	BTEC-902D-18	Fuzzy Logic and Systems	3L:0T:0P	3
11.	VII	PE-2	BTEC-902E-18	Advanced Optical Communication Systems	3L:0T:0P	3
12.	VII	PE-2	BTEC-902F-18	Principles of VLSI Design	3L:0T:0P	3
13.	VII	PE-3	BTEC-903A-18	Audio and Speech Processing	3L:0T:0P	3
14.	VII	PE-3	BTEC-903B-18	Neural Networks	3L:0T:0P	3
15.	VII	PE-3	BTEC-903C-18	Object Oriented Programming with JAVA	3L:0T:0P	3
16.	VII	PE-3	BTEC-903D-18	RADAR and SONAR Engineering	3L:0T:0P	3
17.	VII	PE-3	BTEC-903E-18	Introduction to MEMS	3L:0T:0P	3
18.	VII	PE-4	BTEC-904A-18	Power Electronics	3L:0T:0P	3
19.	VII	PE-4	BTEC-904B-18	Adaptive Signal Processing	3L:0T:0P	3
20.	VII	PE-4	BTEC-904C-18	Data Communication	3L:0T:0P	3
21.	VII	PE-4	BTEC-904D-18	Wireless Sensor Networks	3L:0T:0P	3
22.	VII	PE-4	BTEC-904E-18	Mixed Signal Design	3L:0T:0P	3
23.	VII	PE-4	BTEC-904F-18	Sensors and Transducers	3L:0T:0P	3
24.	VII	PE-5	BTEC-905A-18	Computer Architecture	3L:0T:0P	3
25.	VIII	PE-5	BTEC-905B-18	Intellectual Property Rights (IPRs)	3L:0T:0P	3
26.	VIII	PE-5	BTEC-905C-18	Mobile Computing and Adhoc Networks	3L:0T:0P	3
27.	VIII	PE-5	BTEC-905D-18	Internet of Things	3L:0T:0P	3
28.	VIII	PE-5	BTEC-905E-18	Mechatronics	3L:0T:0P	3
29.	VIII	PE-5	BTEC-905F-18	Soft Computing Techniques	3L:0T:0P	3
30.	VIII	PE-6	BTEC-906A-18	Embedded Systems	3L:0T:0P	3
31.	VIII	PE-6	BTEC-906B-18	Nano Electronics	3L:0T:0P	3
32.	VIII	PE-6	BTEC-906C-18	Satellite Communication	3L:0T:0P	3
33.	VIII	PE-6	BTEC-906D-18	Error Correcting Codes	3L:0T:0P	3
34.	VIII	PE-6	BTEC-906E-18	Bio-Medical Electronics	3L:0T:0P	3

LIST OF OPEN ELECTIVE (OE) COURSES OFFERED BY DEPARTMENT FOR STUDENTS OF OTHER PROGRAMS

Sr. No.	Course Code	Sem	Course Title	L	T	P	Hours/Week	Credits
1.	BTEC-303-18	V	Digital System Design	3	0	0	3	3
2.	BTEC-305-18	VI	Basic Electronics	3	0	0	3	3
3.	BTEC-905F-18	VII	Soft computing Techniques	3	0	0	3	3
4.	BTEC-905D-18	VIII	Internet of Things	3	0	0	3	3
5.	BTEC-602-18	VIII	Optical Fibers & Communication	3	0	0	3	3
6.	HSMC (MME-301)/ HSMC (MME-475)	VIII	Fundamentals of Management for Engineers/Economics for Engineers	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 Performative 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

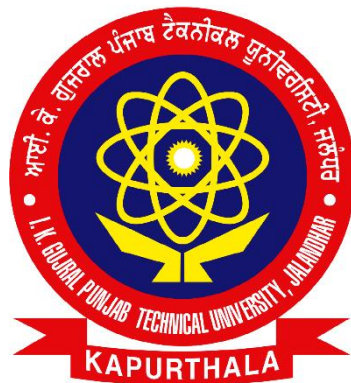
Study Scheme and Syllabus of B.Tech.Electronics & Telecommunication Engineering: Year 2018 & Onwards

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 & Telecommunication 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 course deals with fundamental concepts of digital electronics necessary for 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 modeling styles in VHDL; Dataflow, Behavioral and Structural Modeling; 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
5. Analyze wave propagation on parallel waveguides in modal form

Unit 1: Transmission Lines

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

Unit 2: Maxwell's Equations

Basics of vectors; Vector calculus; Basic laws of Electromagnetics; 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-XXX-18	Credits	L	T	P	Int	Ext
Mathematics III	4	3	1	0	40	60

To be finalized by the Department of Mathematical Sciences

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 (nnp & 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 $\pm 5V$ or $\pm 12V$ 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 Curriculum.

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.

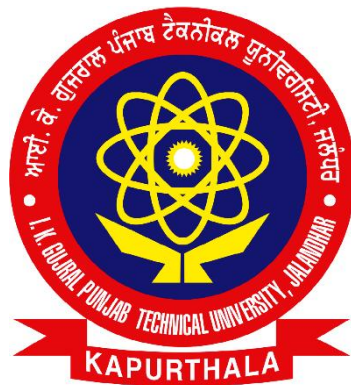
Evaluation shall be based on rubrics for Part – A & B

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 course deals with fundamental concepts of digital electronics necessary for 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 blocks 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

To be finalized by the concerned Board of Studies.

BTEC-403-18	Credits	L	T	P	Int	Ext
Signals & Systems	3	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.

Unit 1: Introduction to Signals and Systems

Signals and systems as seen in everyday-life; 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 behavior 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 behavior.

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; 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.

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.

BTMC-XXX-18	Credits	L	T	P	Int	Ext
Mandatory Course: Environmental Sciences	Non-credit	2	0	0	60	40

To be finalised by the concerned Board of Studies.

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 FET in CD, CG& CS 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
7. To study Gain analysis of Class-B Power Amplifier
7. To study Gain analysis of Class B Push-pull Power Amplifier
7. 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.