GUJARAT TECHNOLOGICAL UNIVERSITY

BRANCH CODE:11 DIPLOMA PROGRAMME IN ELECTRONICS & COMMUNICATION ENGINEERING

SEMESTER - III

COURSE CODE	COURSE TITLE	TEACHING SCHEME				EXAMINATION SCHEME				
		L	T	P	CREDITS (L+T+P)	THEORY MARKS		PRACTICAL MARKS		GRAND TOTAL
						ESE	PA	ESE	PA	
3331101	ANTENNA & WAVE PROPAGATION	3	0	2	5	70	30	20	30	150
3331102	ANALOG ELECTRONICS	4	0	4	8	70	30	40	60	200
3331103	PRINCIPLE OF ELECTRONIC COMMUNICATION	3	0	2	5	70	30	20	30	150
3331104	DIGITAL LOGIC DESIGN	3	1	2	6	70	30	20	30	150
3331105	PROGRAMMING IN C	3	0	4	7	70	30	40	60	200
TOTAL		16	1	14	31	350	150	140	210	850

ESE : END SEMESTER EXAM
PA: PROGRESSIVE ASSESSMENT

L: LECTURE

P: PRACTICAL

T: TUTORIAL

ESE for Practical includes Viva/Practical exam/Performance etc.

PA for Practicals includes TW/Report writing/Mini Project/Seminar etc. related to practicals

PA for Theory includes Written Exam /Assignment/Tutorial Work/Mini Project/Quiz/Presentation or Combination of all with prior intimation to the students at beginning of term

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

Course Curriculum

ANTENNA AND WAVE PROPAGATION
(Code: 3331101)

Diploma Programme in which this course is offered	Semester in which offered
Electronics & Communication Engineering	3rd semester

1. RATIONALE

Antennas play vital role in wireless communication as a terminal component of transmitter and receiver systems. The quality of signals at receiver depends on type of transmitting and receiving antennas, their orientation, transmitting frequency and geographical terrain. For installation & maintenance of wireless systems the basic knowledge of wave propagation theory is essential. This course will help the students to select and install antennas of desired operating frequency for the particular application. It is therefore a core engineering course for electronic and communication engineers and hence students should learn this course for efficient working in field.

2. COMPETENCY (Programme Outcome according to NBA Terminology):

The course content should be taught and with the aim to develop different types of skills so that students are able to acquire following competency

- **Select (with specifications) appropriate antenna for specific wireless communication system.**

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	150
03	00	02	05	70	30	20	30	

Legends: L - Lecture; **T -** Tutorial/Teacher Guided Student Activity; **P -** Practical; **C -** Credit; **ESE** - End Semester Examination; **PA** - Progressive Assessment

4. COURSE DETAILS

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
Unit – I Basic Electromagnetic Theory	1a. Describe properties of electromagnetic waves. 1b. Explain the basic concepts of electromagnetic wave theory.	1.1. Physical concept of generation of EM Wave. • Static electric & magnetic field of steady electric current. • Electromagnetic field and its radiation from a center fed dipole.
	1c. Describe the basic radiating antennas. 1d. For the given application choose the relevant radiator	1.2 Elementary radiator • Hertzian dipole; Half-wave dipole, Power radiated by elementary dipole using Poynting Vector method.
Unit – II Antenna Terminologies	2a. Distinguish between antenna and aerial. 2b. Calculate the basic antenna parameters using standard formulas. 2c. Identify antenna specifications required from standard handbooks.	2.1. Basic parameters: Aerial and antenna, Antenna Impedance, Radiation Resistance, Radiation Pattern, Beam area and beam efficiency, Isotropic radiator gain, directivity and Gain, radiation intensity, half power BW, polarization, antenna losses, antenna efficiency, affective aperture, effective length of antenna, effects of antenna height, antenna temperature, front to back ratio, antenna field zones
Unit – III Basic Antennas & Arrays.	3a. Select antennas and antenna arrays as per their operating frequency ranges and radiation pattern for the specific applications	3.1 Radiation characteristics of wire antennas: Resonant wire antennas (λ, 2λ), Non Resonant (Rhombic) Antenna 3.2 Loop antenna 3.3 Folded dipole 3.4 Antenna Arrays: Uniform linear array, Broad side array, End fire array 3.5 Yagi-uda antenna
Unit – IV Antennas for Special applications	4a. Classify antennas used in VHF/ UHF band	4.1 VHF/UHF antennas: Helical antenna, Parabolic reflector antenna, Horn antenna, Micro strip (patch) antenna, Turnstile and super turnstile antenna, slot antenna
	4b. Identify mobile network antennas.	4.2 Terrestrial mobile communication antennas: Base station antennas, Mobile station antennas
	4a. Explain the concept of Smart Antennas and its applications	4.3 Smart Antennas : Need & Applications
	4a. Prepare the specifications for the required indoor or outdoor DTH systems	4.4 DTH receiver system: outdoor unit, antenna system and indoor unit
Unit – V Wave	5a Explain the effect of ground on electromagnetic waves	5.1 Ground Wave propagation 5.2 Ionosphere Layers and Sky wave

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
Propagation	propagation. 5b Explain properties of Ionospheric layer used for electromagnetic wave propagation.	propagation: Virtual Height, Critical frequency, Maximum usable frequency (MUF), Skip distance, Lowest Usable frequency (LUF), Optimum Usable frequency (OUF)
	5c Explain different modes of wave propagations 5d Select the antennas for specific mode of wave propagation considering all the aspects discussed thus far	5.3 Space Wave propagation: Tropospheric scattered propagation, Duct Propagation

5. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Basic Electromagnetic Theory	05	4	4	2	10
II	Antenna Terminologies	07	4	4	4	12
III	Basic Antennas & Arrays.	12	5	5	8	18
IV	Antennas for Special applications	10	5	5	6	16
V	Wave Propagation	8	3	3	8	14
Total		**42**	**21**	**21**	**28**	**70**

Legends: R = Remember; U = Understand; A = Apply and above levels (Bloom's revised taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6. SUGGESTED LIST OF EXERCISES/PRACTICALS

The practical/exercises should be properly designed and implemented with an attempt to develop different types of practical skills (**Course Outcomes in psychomotor and affective domain**) so that students are able to acquire the competencies (Programme Outcomes). Following is the list of practical exercises for guidance.

Note: Here only Course Outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.

S. No.	Unit No.	Practical/Exercise(Course Outcomes in Psychomotor Domain according to NBA Terminology)	Approx. Hrs. Required
1.	I	Check the radiation pattern of half wave dipole and find HPBW.	02
2.	III	Check the radiation pattern of rhombic antenna.	02
3.	III	Check radiation pattern of loop antenna.	02
4.	III	Check radiation pattern of folded dipole antenna.	02
5.	III	Fabricate the demonstrative physical model of Yagi –Uda antenna with at least 3 radiator and one reflector.	02
6.	III	Test the performance of the Yagi –uda antenna.	02
7.	III	Test the performance of the broad side array.	02
8.	III	Test the performance of the end fire array antenna.	02
9.	IV	Test the performance of helical antenna in horizontal and vertical planes	02
10.	IV	Check the radiation pattern of parabolic reflector antenna.	02
11.	IV	Test the performance of horn antenna.	02
12.	IV	Select the relevant Mobile Antenna System for a particular area	02
13.	IV	Install and commission DTH receiver systems	04
		Total	**28**

7. SUGGESTED LIST OF STUDENTS ACTIVITIES

Following is the list of proposed students activities like:

i. Prepare the chart of various antenna radiation patterns.
ii. Collect details of different types of antenna parameters used in radio/TV transmitter, cellular system, wireless radio set, Radar.
iii. Prepare the demonstration model of commonly used antennas.
iv. Prepare the PPT/animations of 3-D radiation pattern and wave propagation of radio waves.
v. Undertake literature survey and internet search and also handbook/datasheet search for specifications of given antenna.
vi. Install and commission DTH systems.
vii. Visit Satellite Earth Station (SAC)/ Doordarshan / AIR/ FM Radio Station.

8. SPECIAL INSTRUCTIONAL STRATEGY (If Any)

i. In Unit I & II, the fundamental wave propagation equations and formulas of electromagnetic wave propagation theory can be explained without mathematical derivations.
ii. For Unit III, IV & V the teacher should arrange visits to different communication research laboratories as well as state of art industries to justify and reinforce the theory taught.
iii. To familiarizing the working of various type of antennas demonstrate the use of radiation measuring meter , radiation generation instrument and various types of antennas as listed in unit III to the students in the lab period.
iv. Introduce the latest simulation software for better understanding of radiation pattern of various types of antennas.
v. To support and enhance the understanding of the fundamental theory of wave propagation in unit I & V, use of animations and simulation software are recommended.

9. SUGGESTED LEARNING RESOURCES

A) List of Books

S. No.	Title of Books	Author	Publication
1	Antennas and Wave Propagation	Kraus John D, Marhefka Ronald J. and Khan Ahmad S.	Tata McGraw-Hill Education, Fourth Edition, or latest
2	Antennas and Wave Propagation	Raju, G. S. N.	Pearson Education India, 3rd edition or latest
3	Antenna and Wave propagations	Prasad, K.D. and Handa, Deepak	Satya Prakashan , New Delhi, 3rd edition or latest
4	Antenna and Wave propagations	Das, Sisir and Das K.Annapurna	Tata McGraw-Hill Education, 2013
5	Antenna and Wave propagations	Harish, A. R. And Sachidananda M.	Oxford University Press,4th Edition or latest
6	Electronic Communication Systems,	Kennedy, George and Davis, Bernard	Tata McGraw-Hill Education, 4th Edition or latest

B) List of Major Equipments /Materials

i. Experimental antenna trainer kit (preferred with software simulator)
ii. Spectrum analyser - 30 MHz.
iii. Standard DTH receiver system.
iv. Antenna synthesis simulation demonstrative software.

C) List of Software/Learning Websites

i. www.cst.com
ii. http://www.antennamagus.com/
iii. http://www.antennamagus.com/antennas.php?page=antennas
iv. http://emcos.com/Antenna-Simulation-and-Optimization
v. http://www.apparentlyapparel.com/uploads/5/3/5/6/5356442/_____practical_antenna_handbook_fourth_edition_carr.pdf

10. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. U.V. Buch**, Lecturer(SG), Government Polytechnic, Gandhinagar.
- **Prof. J.D. Chauhan**, Lecturer, B & B Institute of Technology, V.V.Nagar.
- **Prof. M.R. Mandli,** Lecturer, Government Polytechnic, Rajkot.
- **Prof. Deepak P. Parikh**, Lecturer, Sigma Institute of Technology (Polytechnic), Vadodara.

Coordinator and Faculty Members from NITTTR Bhopal

- **Dr. Anjali Potnis,** Assistant Professor, Department of Electrical and Electronics Engineering.
- **Dr. Joshua Earnest,** Professor, Department of Electrical and Electronics Engineering.

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

Course Curriculum

ANALOG ELECTRONICS

(Code: 3331102)

Diploma Programme in which this course is offered	Semester in which offered
Electronics and Communication Engineering	3rd Semester

1. RATIONALE

Analogue electronic components and circuits are building blocks for any electronic device used in industries or in daily life. It is therefore necessary for electronics engineers to understand clearly the principles and functioning of the basic analogue components and circuits. This course will enable the students to understand the basics of construction, working, and applications of various types of electronic components such as UJT, JFET, MOSJFET and circuits such as feedback amplifier, oscillators, power amplifiers, operational amplifier, and timers using linear ICs. Practical exercises of this course would enable students to maintain such circuits and in turn maintain equipment having such circuits. This course is therefore one of the basic core courses which is must for every electronic engineer and hence should be taken very sincerely by students.

2. COMPETENCY (Programme Outcome according to NBA Terminology):

The course content should be taught and with the aim to develop different types of skills so that students are able to acquire following competency

- **Maintain various types of analogue electronic components and circuits.**

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	200
4	-	4	8	70	30	40	60	

Legends: L - Lecture; **T -** Tutorial/Teacher Guided Student Activity; **P -** Practical; **C -** Credit; **ESE** - End Semester Examination; **PA** - Progressive Assessment

4. COURSE DETAILS

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
Unit – I **Negative Feedback Amplifiers**	1a. Describe different types of feedback. 1b. List the merits and demerits of negative feedback.	1.1. Concept of feedback: negative and positive 1.2. Merits and demerits of negative feedback
	1c. Explain the concept of negative feedback related to amplifier. 1d. Determine the overall gain of feedback amplifiers for maintenance point of view,	1.3. Negative feedback in amplifiers 1.4. Derivation of equation for overall gain of negative feedback amplifier
	1e. Describe effect of feedback on amplifier parameters.	1.5. Gain, input impedance, output impedance, stability, bandwidth, frequency response, sensitivity, distortion, and noise
	1f. Explain series and shunt type of feedback in amplifier circuits.	1.6. Voltage series amplifier, voltage shunt amplifier, current series amplifier, current shunt amplifier.
Unit – II **Oscillators**	2a. Justify the use of positive feedback in oscillator 2b. Describe working of tank circuit with sketches	2.1. Positive feedback in oscillators 2.2. Barkhausen's criteria for oscillation 2.3. Overall gain of positive feedback amplifier. 2.4. Tank circuit
	2c. Explain the working principle of different types of oscillators 2d. List applications of various types of oscillators.	2.5. RC phase shift oscillator circuit 2.6. Hartley oscillator circuit 2.7. Colpitts oscillator circuit 2.8. Wien Bridge oscillator circuit 2.9. Crystal oscillator
	2e. Describe construction of UJT with sketches. 2f. Explain the working of the UJT with sketches.	2.10. Construction of UJT 2.11. Working and V – I characteristics of UJT 2.12. UJT as a relaxation oscillator
Unit – III **Power Amplifier**	3a. Differentiate between voltage and power amplifier.	3.1. Voltage and power amplifier 3.2. Classification of power amplifier
	3b. Explain working of different types of power amplifier and their applications.	3.3. Working of different types of power amplifier – Class A, B, AB, C and D
	3c. Determine the efficiency of Class A and Class B type of power amplifiers.	3.4. Efficiency of class A and class B amplifier 3.5. Efficiency of transformer coupled power amplifier

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
	3d. Explain working of Push Pull amplifiers 3e. Calculate the efficiencies of Push Pull amplifiers. 3f. Compare the working of different types of power amplifiers.	3.6 Operation of class B push-pull power amplifier 3.7 Efficiency of class B push pull amplifier 3.8 Complimentary symmetry push-pull amplifier
Unit - IV Field Effect Transistor	4a. Explain construction and working principle of JFET 4b. Describe configurations of JFET amplifier.	4.1 JFET: Parameters of JFET – r_d, g_m, μ 4.2 n-channel and p-channel JFET 4.3 JFET configurations: common source, drain and gate
	4c. Differentiate BJT and JFET	4.4 BJT and JFET
	4d. Explain construction and working principle of enhancement type MOSFET 4e. Compare the working of JFET and MOSFET	4.5 Types of MOSFET: enhancement type MOSFET 4.6 JFET and MOSFET as amplifiers
Unit – V Linear Integrated Circuits	5a. Explain working of operational amplifier. 5b. Explain working of differential amplifier.	5.1 Operational amplifier 5.2 Differential amplifier
	5c. Identify the pin specifications and voltage levels of IC 741 in the given sketch, 5d. Explain the open and closed loop concept in Op-amps	5.3 IC-741 and its pin configuration 5.4 Op-Amp: open loop and closed loop amplifier
	5e. Explain the parameters of operational amplifier	5.5 Op-Amp parameters: Input and output offset voltage, Input offset current, Input bias current, CMRR, slew rate, frequency response
	5f. Explain applications of operational amplifier	5.6 Inverting and non-inverting amplifier with derivation of voltage gain 5.7 Summing and differential amplifier, integrator, differentiator, comparator, V-I converter, D-A converter, current booster
	5g. Explain working and applications of Timer IC 555 with a block diagram	5.8 IC 555: basic operation and pin description 5.9 Applications of IC 555: astable, monostable and bistable multivibrator

5. SUGGESTED SPECIFICATION TABLE WITH HOURS and MARKS (THEORY)

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Negative Feedback Amplifiers	08	2	6	2	10
II	Oscillators	10	2	4	6	12
III	Power Amplifier	12	4	6	6	16
IV	Field Effect transistor	13	4	8	4	16
V	Linear Integrated Circuits	13	2	6	8	16
Total		**56**	**14**	**30**	**26**	**70**

Legends: R = Remember; U = Understand; A = Apply and above levels (Bloom's revised taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6. SUGGESTED LIST OF PRACTICAL/EXERCISES

The practical/exercises should be properly designed and implemented with an attempt to develop different types of practical skills **(Course Outcomes in psychomotor and affective domain)** so that students are able to acquire the competencies (Programme Outcomes). Following is the list of practical exercises for guidance.

Note: Here only Course Outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.

S. No.	Unit No.	Practical/Exercise (Course Outcomes in Psychomotor Domain according to NBA Terminology)	Approx. Hrs. Required
1	I	Test the performance of negative feedback amplifier and compare gain, BW with amplifier without feedback.	2
2	II	Build/test Colpitts oscillator for variable frequency.	2
3	II	Build/test Hartley oscillator for variable frequency.	2
4	II	Build/test Wien bridge oscillator for variable frequency.	2
5	II	Build/test crystal oscillator.	2
6	II	Build/test UJT as a Relaxation Oscillator.	2
7	III	Test the performance of a n-channel JFET.	2
8	III	Test the performance of a p-channel JFET.	2
9	III	Determine the r_d, g_m, μ for JFET amplifier.	2
10	III	Build and test MOSFET as an amplifier.	2
11	III	Determine the efficiency of push pull power amplifier.	2
12	IV	Determine the of complementary symmetry push pull amplifier.	2
13	IV	Build/test transformer coupled class-A Power amplifier.	2

S. No.	Unit No.	Practical/Exercise (Course Outcomes in Psychomotor Domain according to NBA Terminology)	Approx. Hrs. Required
14	IV	Build Audio power amplifier circuit using IC 810/LM 386/LM 391 and test it for different input power rating.	2
16	V	Build inverting amplifier using Op-Amp and observe input, output waveforms on CRO.	2
17	V	Build non-inverting amplifier using Op-Amp and test its performance using the CRO.	2
18	V	Build/test IC 741 using the CRO for different values of R and C.	2
20	V	Build/test Op-Amp as summing amplifier.	2
21	V	Build/test Op-Amp as V to I Converter.	2
22	V	Build/test inverting amplifier using IC 324	2
23	V	Build/test Astable multivibrator using IC 555 for different values of R and C.	2
24	V	Build/test Monostable multivibrator using IC 555 for different values of R and C.	2
25	V	Build/test Bistable multivibrator using IC 555.	2
26	V	Build/test IC 555 as sequential Timer.	2
27	V	Build/test Astable multivibrator using IC 556.	2
28	V	Build/test mini project using IC 41/555/810/723/556/386/391	2
	Total		56

7. SUGGESTED LIST OF STUDENT ACTIVITIES

i. Access websites for collecting s specification of components/ICs using datasheet.
ii. Present seminar on any one topic related to the subject.
iii. Develop a small circuit/ mini project using IC 741/555/810/723/556/386/391.
iv. Explore details of power amplifier IC used in Radio/Television/Home theatre with the help of datasheet available in the handbook.

8. SPECIAL INSTRUCTIONAL STRATEGY (If Any)

i. Computer based tutorial (CBT) describing operation of transistor/JFET and other active components with the help of animations or video films.
ii. Circuit simulation using Software like Electronic work Bench/multiSIM/ Circuit Maker.
iii. Seminars and group discussion.
iv. Mini projects based on op-amp IC or Timer IC.

9. SUGGESTED LEARNING RESOURCES

A) List of Books:

S. No.	Title of Books	Author	Publication
1	Basic Electronics and Linear Circuits	Bhargava, N.,Kulshreshtha D., S.Gupta	Tata McGraw- Hill Education, 2011
2	Electronics Devices and Circuits	Mottershead, Allen	PHI Learning,2011

3	Electronic Principles - with simulation CD	Malvino, A.P.	Tata McGraw- Hill , Education,7th Edition
4	Principles of Electronics	Mehta ,V.K.	S. Chand, 2004 or latest
5	Electronics Devices and Circuit Theory	Boylestad, Robert & Louis, Nashelsky	Pearson, 10th Edition
6	Op-Amps and Linear Integrated Circuits	Gayakwad , Ramakant A	PHI, Learning,4th Edition
7	Electronic Devices and Circuits	Dr. Sharma, Sanjay	KATSON,2012
8	Fundamentals of Electronic Devices and Circuits	David, A Bell	Oxford Press, 5thEdition, 2008

B) List of Major Equipment/Materials

i. Function Generator (upto 100Mhz)
ii. Digital Multimeter (Auto ranging, 3and1/2 digit display)
iii. D.C. Power Supply (0-30volts,10amp.)
iv. Cathode Ray Oscilloscope (50MHz, Dual Trace)
v. Digital Storage Oscilloscope (30MHz, auto capturing)
vi. Experimental Trainer Kits, Bread Board, General Purpose PCB, active and passive components

C) List of Software/Learning Websites

i. Electronic Work Bench/MultiSIM /Circuit Maker
ii. www.nptel.com
iii. www.ocw.mit.edu

10. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics :

- **Prof. B. P. Raval,** Lecturer, EC Department Government Polytechnic, Rajkot
- **Prof. S. N. Sampat,** Lecturer, EC Department, Government Polytechnic, Gandhinagar
- **Prof.(Smt.) K N Vaghela,** Lecturer, EC Department, Government Polytechnic, Ahmedabad
- **Prof. N. B. Shah,** Lecturer, EC Department, Gvernment Polytechnic,Vadnagar.

Coordinator and Faculty Members from NITTTR Bhopal

- **Dr. Anjali Potnis,** Assistant Professor, Department of Electrical and Electronics Engineering
- **Dr. Joshua Earnest,** Professor, Department of Electrical and Electronics Engineering

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

Course Curriculum

PRINCIPLES OF ELECTRONIC COMMUNICATION (Code: 3331103)

Diploma Programme in which this course is offered	Semester in which offered
Electronics & Communication Engineering	3rd semester

1. RATIONALE

Wireless communication plays vital role in the field of electronic communication systems which includes radio, mobile and satellite communication systems. This requires that an electronic engineering diploma holder will have to maintain electronic communication equipment and circuits related to this area. This course is intended to lay the foundation for understanding the advanced communication courses in the subsequent semesters. Hence this course describes fundamentals of wireless communication covering analogue and digital modulation techniques. Since it is a basic core course, students should develop in depth understanding of all concepts and principles so that they may learn advance courses easily and effectively.

2. COMPETENCY (Programme Outcome according to NBA Terminology):

The course content should be taught and with the aim to develop different types of skills so that students are able to acquire following competency

- **Maintain Electronic Communication Systems.**

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	
3	0	2	5	70	30	20	30	150

Legends: L - Lecture; **T -** Tutorial/Teacher Guided Student Activity; **P -** Practical; **C -** Credit; **ESE** - End Semester Examination; **PA** - Progressive Assessment

4. COURSE DETAILS

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
Unit – I Basics of Communication System	1a. Describe EM wave spectrum, frequency ranges and its applications.	1.1 Electromagnetic (EM) wave spectrum, frequency bands and their applications domain
	1b. Represent Sinusoidal, Rectangular, Saw-tooth, Impulse and Pulse waveform.	1.2 Signals and its representation: analog and digital Signal, Pulse, Impulse, Saw-tooth, sinusoidal and rectangular (In Time & frequency domain)
	1c. Describe communication system.	1.3 Block diagram of communication system
	1d. Justify the need for modulation. 1e. Differentiate between analog and digital modulation using waveforms.	1.4 Modulation: Definition & its classification based on analog & pulse signal as carrier. Concept of digital modulation
	1f. Distinguish between external and internal noise and noise sources.	1.5 Noise in communication system, classification of noise, signal to noise ratio(S/N) and noise figure
Unit – II Amplitude and Angle Modulation	2a. Derive the mathematical expression for Double Sideband Suppressed Carrier (DSBSC) Amplitude Modulation (AM) signal 2b. Sketch the frequency spectrum of the DSBSC Amplitude Modulated wave.	2.1 Frequency spectrum and mathematical expression for the Double sideband suppressed carrier (DSBSC) Amplitude Modulated wave
	2c. Sketch the frequency spectrum of Single sideband (SSB) Amplitude Modulated wave.	2.2 Single sideband (SSB) Amplitude modulated wave
	2d. Derive mathematical relation between carrier power, modulated signal power and modulation index 2e. Calculate total transmitted power for single and multiple modulating signals.	2.3 Modulation Index, carrier power, modulated signal power and modulation index 2.4 Single and multiple signal modulation
	2f. Explain generation of AM signal using square law modulator circuit.	2.5 AM using square law modulator circuit.
	2g. Calculate the modulation index and bandwidth of frequency modulated (FM) signal.	2.6 Mathematical representation of FM wave, Frequency spectrum, Modulation index and Bandwidth of FM
	2h. Discriminate between phase and frequency modulation with relevant sketches.	2.7 Phase Modulation (PM) and FM
	2i. Distinguish between Pre-emphasis and De-emphasis	2.8 Pre-emphasis and De-emphasis circuits
	2j. Describe various FM signal generation techniques	2.9 Generation techniques for FM wave : • Basic reactance modulation • Varactor diode modulation • Stabilized reactance FM modulator

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
Unit – III AM and FM receivers	3a. Define the characteristics of radio receiver 3b. Describe the functions of each block of super heterodyne receiver	3.1 Characteristic of radio receiver, Sensitivity, Selectivity, Fidelity, Image frequency rejection 3.2 Block diagram of super heterodyne receiver
	3c. Describe AM detection method	3.3 Envelope detector using diode
	3d. Explain working of various types of FM demodulator circuits.	3.4 Basic FM demodulators: Slope detection, Balanced slop detection, Phase discriminator, Balanced ratio detector
	3e. Explain functions of various blocks of FM receiver	3.5 Block diagram of basic FM receiver
	3f. Explain working of communication receiver using a block diagram	3.6 Communication receiver: Double conversion principle
	3g. Describe need and working of squelch circuit 3h. Describe need and working of Amplitude limiting circuit 3i. Describe need and working of AGC circuit	3.7 Squelch circuit, Amplitude limiting action, Automatic gain control circuits and its working
Unit IV Pulse Modulation	4a. Explain PAM, PWM and PPM signals timing diagram.	4.1 Pulse Modulation techniques: PAM,PWM, PPM
	4b. Calculate the sampling frequency for any modulating signal	4.2 Sampling of analog data (Sample & hold)
	4c. Explain various blocks of PCM system. 4d. Describe advantage & disadvantage of PCM system	4.3 Basic Block diagram of Single channel Pulse Code modulation (PCM) system
	4e. Pros & cons of digital data communication	4.4 Digital Communication
Unit V Introduction to Digital Modulation technique	5a. Differentiate between bit, symbol & Baud rate.	5.1 Bit rate, Baud rate, symbol
	5b. Draw RZ, NRZ (Polar & Unipolar),Manchester coding AMI & HDB-3 signal.	5.2 Channel coding techniques
	5c. Explain 4 level digital multiplexing hierarchy 5d. Describe TDMA frame.	5.3 Concept of Time division digital multiplexing, TDMA frame
	5e. Explain PCM-TDM system	5.4 Block diagram of basic PCM-TDM system
	5f. Sketch the waveforms of ASK, FSK, PSK,BFSK & BPSK & understands its importance in Digital communication	5.5 Digital modulation techniques: Concept of ASK, FSK,PSK, BFSK ,BPSK using waveform & constellation diagram

5. SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)

5. Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Basics of communication system	08	02	04	01	07
II	Amplitude and Angle modulation	10	05	10	06	21
III	AM and FM Receivers	08	04	05	05	14
IV	Pulse Modulation	08	05	10	06	21
V	Introduction to Digital Modulation Technique	08	02	02	03	07
Total		**42**	**18**	**31**	**21**	**70**

Legends: R = Remember; U = Understand; A = Apply and above levels (Bloom's revised taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6. SUGGESTED LIST OF EXERCISES/PRACTICAL

The practical/exercises should be properly designed and implemented with an attempt to develop different types of practical skills **(Course Outcomes in psychomotor and affective domain)** so that students are able to acquire the competencies (Programme Outcomes). Following is the list of practical exercises for guidance.

Note: Here only Course Outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.

S. No.	Unit No.	Practical/Exercise	Approx. Hrs. Required
1	I	Measure amplitude of different sinusoidal frequency signals in frequency domain using Spectrum Analyser.	2
2	II	Measure modulation index of an AM envelope.	2
3	II	Measure modulation index of an AM envelop by trapezoidal Method.	2
4	III	Obtain the frequency response of Pre-emphasis and De-emphasis circuit.	2
5	II	Determine Modulation Index of Frequency Modulated wave.	2
6	III	Locate various sections of AM radio receiver trainer kit and draw the waveforms at input and output side of each section.	2
7	III	Check the demodulated AM signal waveform using envelope detector and draw its input output waveform.	2
8	III	Demonstration of fault finding of AM or FM radio receivers.	2

S. No.	Unit No.	Practical/Exercise	Approx. Hrs. Required
9	III	Obtain the response of AGC circuit of the radio receiver.	2
10	IV	Based on the sampling frequency, reconstruct the signal	2
11	IV	Check the performance PCM system for various sinusoidal signals	2
12	IV	Check the performance of PAM system	2
13	II,III	Simulate AM,FM and SSB signal using Simulation software	2
14	V	Check the response of ASK modulator and Demodulator	2
15	V	Check the response of BFSK modulator and Demodulator	2
16	V	Check the response of BPSK modulator and Demodulator	2
		Total	**32**

7. SUGGESTED LIST OF STUDENT ACTIVITIES

Following is the list of proposed student activities.

i Explore circuit of AM / FM receiver, assemble and test it
ii Explore circuit of AM / FM transmitter.
iii Collect details of HAM radio and CB radio and watch the working demonstration if possible.
iv Explore details (Freq. / Standards/Company/Model/Range) of Walky-Talky, Cordless phone and Wireless set used by Police department.
v Industrial Visit of AM / FM Radio Transmitter

8. SPECIAL INSTRUCTIONAL STRATAGIES (If Any)

i Animation/video films showing the working principle and features of FM/AM radio receiver and PCM/DM/ADM should be shown to students while teaching the concern topic.
ii Demonstrate working of AM/FM/Communication receiver.

9. SUGGESTED LEARNING RESOURCES

A) List of Books:

S. No.	Title of Books	Author	Publication
1	Analog and Digital Communication	Singal, T. L.	Tata Mcgraw Hill, India latest edition
2	Electronic Communication Systems	George Kennedy and Bernard Davis	Tata McGraw Hill 5th edition or latest
3	Electronics Communication	Dennis Roddy and John Coolen	Pearson Eductation 4th Edition
4	Electronics Communication System (Fundamental to Advance)	Wayen Tomasi	Pearson Education, 5th edition
5	Analog Communication	V.Chandra Sekar	Oxford University Press
6	Electronic Communications Modulation and Transmission	Robert J. Schoenbeck	PHI Learning, 2nd Edition

7	Analog Communication	Dr.Sanjay Sharma	KATSON, 2012
8	Digital Communication	John G.Proakis,	McGraw Hill, latest Edition
9	Principles of Digital Communication	Taub and Schilling	Tata McGraw-Hill" 28th reprint, 2003

B) List of Major Equipment/Materials

i Spectrum analyser, 30 MHz

ii CRO – Dual trace, 100 MHz

iii RF generator/wideband oscillator

iv AM/FM radio receiver trainer Kit

v Digital Modulation trainer Kit

vi Communication receiver Kit

C) List of Software/Learning Websites

i AM, FM and SSB signal generation using any simulation software.

ii MATLAB software/ Electronics work bench software for the simulation

PCM, ASK, PSK, FSK, AM and FM generation and detection circuits.

10. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. S.J. Chauhan**, HOD Electronics & Communication Engineering, G.P. Rajkot
- **Prof.M.N.Charel**, HOD Electronics & Communication Engineering, G.P. Ahmedabad
- **Prof. K.J. Pithadiya**, Lecturer, Electronics and Communication Engineering, BBIT, Vallabh Vidhyanagar
- **Prof. (Smt.) R.M. Mehta,** HOD Electronics and Communication Engineering, Sigma Polytechnic, Vadodara

Coordinator and Faculty Members from NITTTR Bhopal

- **Dr. Anjali Potnis,** Associate Professor, Department of Electrical and Electronics Engineering
- **Dr. Joshua Earnest,** Professor, Department of Electrical and Electronics Engineering

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

Course Curriculum

DIGITAL LOGIC DESIGN
(Code: 3331104)

Diploma Programme in which this course is offered	Semester in which offered
Electronics and Communication Engineering	3rd Semester

1. RATIONALE

Digital technology is the fastest growing technology and have revolutionised the electronics Industry. In most of the applications digital technology has replaced analogue technology. Digital logic is heart of digital electronic circuits. A basic understanding of this subject is therefore essential to effectively maintain digital electronic devices. The study of this course will enable the students to test the working and rectify the faults of common digital circuits.

2. COMPETENCY (Programme outcome according to NBA Terminology)

The course content should be taught and implemented with the aim to develop different types of skills so that students are able to acquire following competency:

- **Maintain the digital electronic circuits.**

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	
03	01	02	06	70	30	30	20	150

Legends: L - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** - Practical; **C** - Credit; **ESE** - End Semester Examination; **PA** - Progressive Assessment

4. COURSE DETAILS

Unit	Major Learning Outcomes ('Course Outcomes' in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
Unit – I Number systems and codes	1a.Differentiate binary and decimal number system 1b. Perform arithmetic operations on Binary numbers	1.1 Introduction to Digital System 1.2 Binary and digital number system. 1.3 Binary arithmetic operations: addition, subtraction, multiplication and division 1.4 Complements: n's, (n-1)'s compliments 1.5 Subtraction using complement method.
	1c. Convert of number systems to octal to hexadecimal and vice versa	1.6 Octal number system 1.7 Hexadecimal number system. 1.8 Conversion from binary to octal, decimal and hexadecimal number systems and vice versa.
	1d. Interpret the Binary codes.	1.9 Codes: BCD, Gray, Excess-3, ASCII, EBCDIC.
Unit – II Boolean algebra and logic gates	2a. Simplify the Boolean functions.	2.1. Basic theorems and properties of Boolean algebra. 2.2. Boolean functions: Sum of Product (SOP) and Product of Sum (POS) expressions.
	2b.Describe functions of Logic gates.	2.3. Basic Digital Logic Gates: Symbol, operation and truth-table of AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR gates. 2.4. Positive and negative logic system.
	2c. Implement the Boolean functions using logic gates for	2.5. Algebraic simplification of Boolean expression 2.6. NAND-NOR circuit implementations 2.7. AND-OR -**Invert** implementations
	2d.Simplify Boolean expression using K-map.	2.8. Karnaugh map(K-map) simplification Techniques for SOP and POS functions up to Four variable 2.9. Don't care condition for simplification of Boolan function.
Unit – III Combinational logic circuits	3a. Explain function of combinational circuits	3.1. Combinational Circuits: Half adder, full adder, parallel binary adder, half Subtractor , full subtractor, parallel binary subtractor,1's complement subtractor, 2's complement subtractor/adder BCD adder.
	3b. Implement various combinational circuits.	3.2. Binary to Gray and Gray to binary code converters 3.3. Decoder and Encoder 3.4. Multiplexers and Demultiplexers 3.5. Magnitude Comparator 3.6. Bit error correction: Parity Generators and Checkers. 3.7. BCD to Seven segment decoder

Unit	Major Learning Outcomes ('Course Outcomes' in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
Unit – IV Sequential logic circuits	4a. Describe the function of various types of flip-flops with the help of circuit diagram, truth table and timing diagram.	4.1. Types of flip-flops: Latch and Flip-flop, S-R flip-flops, asynchronous and synchronous S R flip flops, D flip flop, J-K flip flop, JK master slave flip flop, T Flip Flop, Edge triggered Flip-Flops.
	4b. Describe the working of various Registers with the help of circuit diagram, truth table and timing diagram.	4.2. Registers: Classification of Shift Register, Serial in serial-out, serial-in parallel-out, parallel-in serial-out and parallel-in parallel out.
	4c. Explain the working of various types of Counters with the help of circuit diagram, truth table and timing diagram.	4.2. Asynchronous(ripple) 4-bit binary counter 4.3. BCD Counter. 4.4. Synchronous counters 4.5. UP/DOWN counter 4.6. Ring counters.
Unit – V D/A,A/D and Memories	5a. Explain working of D/A converters 5b. Explain working of A/D converters.	5.1. D/A Conversion: Weighted resister, R-2R ladder network, Accuracy and Resolution. 5.2. A/D Conversion: Dual slope type, Counter type, Successive approximation, Flash type.
	5c. Classify semiconductor Memories	5.3. Semiconductor Memory: RAM-SRAM and DRAM, ROM-PROM, EPROM, EEPROM, Flash memory.
Unit – VI Digital Integrated Circuits	6a. Explain working of Bipolar and unipolar logic families with their characteristics.	6.1. Logic families and level of Integration SSI, MSI,L SI, VLSI 6.2. Characteristics of digital ICs-fan-in, fan-out, propagation delay, power dissipation, noise margins, figure of merit. 6.3. Transistor-Transistor logic (TTL) circuits: Open collector output, Totem pole output, Tri-state output. 6.4. Emitter Coupled Logic (ECL). 6.5. Integrated Injection Logic (IIL). 6.6. MOS and CMOS Logic.
	6b. Compare Logic families.	6.7. Comparison of different logic families
	6c. Define programmable Devices.	6.8. Programmable devices : PLA,PLD,PAL,FPGA,ASIC

5. SUGGESTED SPECIFICATION TABLE WITH HOURS and MARKS (THEORY)

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Number systems and codes	06	02	04	03	09
II	Boolean algebra and logic gates	08	00	08	06	14
III	Combinational logic circuits	08	04	06	04	14
IV	Sequential logic circuits	08	04	06	04	14
V	D/A,A/D and Memories	06	04	04	02	10
VI	Digital Integrated Circuits	06	04	05	00	09
Total		**42**	**18**	**33**	**19**	**70**

Legends: R = Remember; U = Understand; A = Apply and above levels (Bloom's revised taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6. SUGGESTED LIST OF EXERCISES/PRACTICAL

The practical/exercises should be properly designed and implemented with an attempt to develop different types of practical skills (**Course Outcomes in psychomotor and affective domain**) so that students are able to acquire the competencies (Programme Outcomes). Following is the list of practical exercises for guidance.

Note: Here only course outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of Programme Outcomes/Course Outcomes in ***affective domain*** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.

S. No.	Unit No.	Practical/Exercise ('Course Outcomes' in Psychomotor Domain according to NBA terminology)	Approx Hrs. Required
01.	II	Build/Test the functionality of Basic and Advance Logic Gates**.**	2
02.	II	Build/Test 2 input basic logic gates using NAND gate .	2
03.	II	Build/Test 2 input basic logic gates using NOR gate .	2
04.	III	Build a circuit to Convert 4 bit Binary to Gray Code using logic gates	2
05.	III	Build a circuit to Convert 4 bit Gray to Binary Code using logic gates	2
06.	III	Build/Test Half Adder Circuit.	2
07.	III	Build/Test Full Adder Circuit.	2
08.	III	Build/Test Half Subtractor Circuit.	2
09.	III	Build/Test 4 bit Parallel Adder circuit.	2
10.	III	Build/Test the 3X8 Decoder circuit.	2
11.	III	Build/Test the 8X1Multiplexer circuit.	2

S. No.	Unit No.	Practical/Exercise ('Course Outcomes' in Psychomotor Domain according to NBA terminology)	Approx Hrs. Required
12.	III	Build/Test BCD to Seven segment LED Display circuit.	2
13.	IV	Build/Test the functionality of the SR Flip-Flop.	2
14.	IV	Build/Test the functionality of the JK Flip-Flop.	2
15.	IV	Build/Test the working of the Shift Register.	2
16.	IV	Build/Test the working of the 4 bit Ripple Counter.	2
17.	IV	Build/Test the working of 4 bit UP - DOWN Counter.	2
18.	V	Build/Test Analog/Digital converter (ADC 0809 or equivalent)	2
19.	V	Build/Test digital to analog converter (DAC 0808 or equivalent).	2
20.	VI	Design and Develop mini project using digital logic.	2
		Total	**40**

7. SUGGESTED LIST OF STUDENT ACTIVITIES

i. Read and note down specifications of Digital ICs using data sheet: IC number/ Pin Diagram/voltage levels, applications for the following Digital ICs (TTL/CMOS): AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR gates, Decoder, Multiplexer, BCD to 7-segment decoder, SR FF,JK FF, D FF, shift Register, Counter, ADC, DAC.
ii. Solve real life problems using binary logic theory and implement it using digital logic circuits.
iii. Explore working of Digital clock/Digital panel.
iv. Prepare mini project using Various Digital IC and display devices.

8. SPECIAL INSTRUCTIONAL STRATEGIES (if any)

i. Take small instrumentation components to the class when teaching
ii. Use tutorial classes for designing simple digital logical circuits and other teacher guided student activities.
iii. Internet based home assignments
iv. Mini projects (in group of three to four students)

9. SUGGESTED LEARNING RESOURCES

A) List of Books

S. No.	Title of Books	Author	Publication
1.	Digital Logic and Computer Design	M. Morris Mano	Pearson Education, New Delhi, 2011 or latest
2.	Digital Principles and Application	Malvino and Leech	TMH Pub., New Delhi, 6th Edition or latest
3.	Fundamentals of Digital Circuits	A. Anand Kumar	PHI Learning, New Delhi, 2nd Edition or latest
4.	Morden Digital Electronics	Jain, R P	TMH Education , New Delhi, 3rd Edition or latest
5.	Digital Electronics	Kharate G.K.	OXFORD University Press, 2010

B) List of Major Equipment/Materials with Broad Specifications

i. Digital Logic trainer board.
ii. A/D and D/A trainer modules.
iii. Universal counter module
iv. Digital IC tester
v. Regulated power supply

C List of Software/Learning Websites

i. www.nptel.iitm.ac.in
ii. www.ocw.mit.edu
iii. www.slideshare.net/

10. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. K. R .Vadalia**, Lecturer Electronics and Comm. Engineering, G.P. Rajkot.
- **Prof. T. P. Chanpura**, Lecturer Electronics and Comm. Engineering, G.P. Ahmedabad.
- **Prof. M. S. Dave**, Lecturer Electronics and Comm. Engineering, G.P. Ahmedabad.
- **Prof. U .V. Buch**, Lecturer Electronics and Comm. Engineering, G.P. Gandhinagar
- **Prof. K. A. Dave**, Lecturer Electronics and Comm. Engineering, VPMP, Gandhinagar

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GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

Course Curriculum

Course Title: PROGRAMMING IN C
(Code: 3331105)

Diploma Programme in which this course is offered	Semester in which offered
Electronics and Communication	3rd Semester

1. RATIONALE:

C forms the basics of C++, C#, Visual C/C++ etc which is current requirement in the information technology (IT) and computer science (CS). It is one of the most commonly used programming language in industry by engineers. It is a middle level language which combines features of both the high level and low level language. It is widely used to develop system programming, operating systems, embedded systems. Also, C is used for creating computer applications that are used in writing embedded software/firmware for various micro-controllers based products in electronics, industrial and communications. C is also used in developing verification software, test code and simulators for various applications and hardware products. It is therefore very important for electronic engineers to develop mastery over C language.

2. COMPETENCY (Programme Outcome according to NBA Terminology):

The course should be taught and implemented with the aim to develop different types of skills leading to the achievement of the following competencies:

- **Develop programs in C language**.

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	200
3	0	4	7	70	30	40	60	

Legends: L - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** - Practical; **C** - Credit; **ESE** - End Semester Examination; **PA** - Progressive Assessment

.

4. COURSE DETAILS

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
Unit – I Concepts , Constants, Variables and Data Types	1a. Prepare flowcharts 1b. Develop algorithms	1.1 Concepts of programming methodology. 1.2 Flowchart 1.3 Algorithm
	1c. Learns concept of constants and variables	1.4 Character set 1.5 'C' tokens 1.6 Keywords & Identifiers 1.7 Constants 1.8 Variables, Declaration of variables 1.9 Assigning values to variables
	1d. Distinguishes different data types and storage class	1.10 Data types 1.11 Storage Class, Declaration of storage 1.12 class
Unit – II Operators and Expressions	2a. Creates arithmetic and logical programs	2.1 Arithmetic operators 2.2 Relational operators 2.3 Logical operators 2.4 Assignment operators 2.5 Increment and Decrement operators 2.6 Conditional operators 2.7 Bitwise operators and Special Operators 2.8 Evaluation of arithmetic and logical 2.9 expressions
	2b. Operates input and output Functions	2.10 Formatted input & output 2.11 Unformatted input & output 2.12 I/O Functions: scanf(), printf(), getch(), putch(), gets(),puts() Programming exercises based on arithmetic and logical expressions
Unit – III Branching and Looping	3a. Develops decision making sub routines	3.1 IF statement 3.2 IF..else statement 3.3 Nesting of if..Else statement 3.4 Else if ladder 3.5 Switch Statement 3.6 The? : Operator 3.7 Go To statement. 3.8 Programming based on decision making
	3b. Implements looping in programs	3.9 While statement 3.10 Do and Do while statement 3.11 For statement 3.12 Jumps in Loops 3.13 Use of break and continue statements in looping 3.14 Complex programming exercises

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
Unit – IV Arrays and Pointers	4a. Creates ability of handling large size data of similar nature.	4.1 Introduction to Arrays and Strings 4.2 One dimensional arrays of int, float & characters 4.3 Initializing two dimensional arrays 4.4 Programming exercises based on One dimensional arrays
	4b. Understands efficient use of memory, access and distinguish real world data types	4.5 Introduction to pointers 4.6 Declaration and initialization of pointers 4.7 Structure definition & initialization 4.8 Programming exercises based on Pointers and structures
Unit – V User Defined, Library Functions and File Management	5a. Creates own functions and able to operate available library functions	5.1 Introduction of User Defined functions (UDF) 5.2 Call by value & Call by reference 5.3 Library Functions: clrscr(), abs(), sqrt(), og(), pow(), int(), isdigit(), isalpha(), toupper(), tolower(), strlen(), strcat(), strcpy, strcmp 5.4 Differences between library function & 5.5 UDF 5.6 Recursive function (Only Factorial Example) 5.7 Programming exercises based on UDF and library functions
	5b. Develops ability to operate real world projects	5.8 Introduction of file management. 5.9 Defining, Opening and Closing a file 5.10 Input and Output Operations on files 5.11 Programming exercises based on file management

5. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Concepts, Constants, variables and data types	8	3	5	6	14
II	Operators and expressions	9	2	4	10	16
III	Branching and looping	12	4	6	10	20
IV	Arrays, Pointers and Structures	8	3	4	5	12
V	User defined functions, library functions and file management	5	2	2	4	8
	Total	42	14	21	35	70

Legends: R = Remember; U = Understand; A = Apply and above levels (Bloom's revised taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6. SUGGESTED LIST OF EXERCISES/PRACTICAL

The practical/exercises should be properly designed and implemented with an attempt to develop different types of practical skills **(Course Outcomes in psychomotor and affective domain)** so that students are able to acquire the competencies **(Programme Outcomes)**. Following is the list of practical exercises for guidance.

Note: Here only Course Outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.

Following is the list of Practical/exercise for guidance.

S. No.	Unit No.	Practical/Exercise (Course Outcomes in Psychomotor Domain according to NBA Terminology)	Approx. Hrs. Required
1	**I**	Use the software for editing compiling and running C programs.	2
2	**I**	Use different menu options of software	2
3	**I**	Initialize local variables	2
4	**II**	Perform simple arithmetic using local variables	2
5	**II**	Output data using printf and cout statement	2
6	**II**	Input data using scanf and cin statements	2

S. No.	Unit No.	Practical/Exercise (Course Outcomes in Psychomotor Domain according to NBA Terminology)	Approx. Hrs. Required
7	**II**	Out put the data on screen using printf in required formats	2
8	**II**	Use of various mathematical operators in C	2
9	**II**	Perform floating point arithmetic programs	2
10	**II**	Evaluate simple formula using C programs	2
11	**II**	Develop & Test programs using Conditional or Logical expressions	2
12	**III**	Develop & Test programs with control structure like if , if-else	2
13	**III**	Develop & Test programs with control structure like nested if-else	2
14	**III**	Develop & Test programs with else if ladder	2
15	**III**	Develop & Test Programs with switch & break statement	2
16	**III**	Develop & Test program with while loop	2
17	**III**	Develop & Test program with do while loop	2
18	**III**	Develop & Test program with for loop	2
19	**III**	Develop & Test program using break and continue statements	2
20	**IV**	Develop & Test programs to declare and initialize arrays	2
21	**IV**	Develop & Test programs with one and two dimensional arrays	2
22	**IV**	Develop & Test programs with character type arrays	2
23	**IV**	Develop & Test programs to use library functions of C	2
24	**IV**	Develop & Test programs related to pointer variables	2
25	**IV**	Develop & Test programs related to structure variables	2
26	**V**	Develop & Test programs with user defined functions	2
27	**V**	Develop & Test programs to pass the value of local variables into your C functions	2
28	**V**	Create and read/write ASCII character file	2
		Total	**56**

7. SUGGESTED LIST OF STUDENT ACTIVITIES

Following is the list of proposed student activities like:

1. Multiple choice questions, short questions and answers
2. Technical Quiz, seminar and debate
3. Rapid code development and debugging competition.
4. The course activities include: Formal Lecture: 30% Supervised Classroom Work:
5. 30% Supervised Laboratory Tutorials: 30% Unsupervised Directed Learning: 10%

8 SPECIAL INSRUCTIONAL STRETAGIES (If Any)

i. Concepts will be introduced in lectures using charts/ppt.

ii. Quiz on various topics

iii. Students should be helped in developing logic on individual basis (some sessions may be as tutorials)

iv. Practical work will be through laboratory sessions.

9. SUGGESTED LEARNING RESOURCES

(A) List of Books:

S. No.	Title of Books	Author	Publication
1	Programming in C	Balagurusamy, E (Fifth Edition)	Tata McGraw-Hill, New Delhi, 2012
2	Programming in C	Gottfried Byron (Third Edition)	Tata McGraw-Hill, New Delhi, 2012
3	Introduction to C Programming (With CD ROM support)	Reema Thareja (First Edition)	Oxford University Press, 2012
4	Programming in C	Ashok N Kamthane (Second Edition)	Pearson
5	Let Us C	Kanetkar Yashvant (Twelfth Edition)	BPB Publications, 2012
6	Programming in C	Kernighan Brian and Ritchie Dennis (Second Edition)	Prentice Hall of India Pvt. Ltd., New Delhi, 2012

B. List of Major Equipment/Materials

i. Computers with C and C++ language programming facilities. (Separate computer for each student)

ii. Multimedia projector, Tutorial Video CD (Programming in C), Expert video lectures.

C List of Software/Learning Websites

i. Software/tools : Turbo C or Borland C, Visual Studio

ii. Theory and programming concepts: www.nptel.iitm.ac.in

iii. www.nptelvideos.com/programming/c_programming_videos.php

iv. www.ocw.mit.edu (Practical Programming in C - MIT Open Course Ware)

v. www.cprogramming.com

vi. http://www2.its.strath.ac.uk/courses/c/

vii. http://www.iu.hio.no/~mark/CTutorial/C-Tut-4.02.pdf

10. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. S. N. Sampat**, Sr. Lecturer, Government Polytechnic, Gandhinagar
- **Prof. G.V. Parmar**, Lecturer, Government Polytechnic, Jamnagar
- **Prof. R. B. Shah**, Sr. Lecturer, Government Polytechnic, Ahmedabad.
- **Prof. (Smt.) P. G. Patel**, Lecturer, Government Polytechnic, Ahmedabad.

Coordinator and Faculty Members from NITTTR Bhopal

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