**GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT**

**COURSE CURRICULUM**
**COURSE TITLE: MULTIMEDIA COMMUNICATION**
**(COURSE CODE: 3361106)**

| Diploma Programme in which this course is offered | Semester in which offered |
|---|---|
| Electronics & Communication Engineering | Sixth |

## 1. RATIONALE

Multimedia communications have brought the paradigm shift in electronic communication system. The most common day to day gadgets and applications which use multimedia are telephone, television, wireless systems, internet and video call and video conferencing, satellite television, remote file transfer etc. The objective of this course is to introduce the topics like multimedia file formats, multimedia network standards, satellite communication and telecommunication switching systems, which are used for communication everywhere. This course will help the students to develop the skills to operate and maintain the multimedia communication system and will also strengthen the job opportunities of electronics and communication engineering students.

## 2. COMPETENCY

The course content should be taught and implemented with the aim to develop required skills in the students so that they are able to acquire following competency:

- **Operate and maintain multimedia communication systems in the communication chain**

## 3. COURSE OUTCOMES (COs)

The theory should be taught and practical should be carried out in such a manner that students are able to acquire required learning outcomes in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

i. Explain telecommunication network architecture and performance of telecommunication switching system
ii. Describe components satellite communication system
iii. Identify requirements and of ISDN
iv. Identify different standards for multimedia communication.
v. Choose required networks standards and file formats for multimedia communication.

## 4. 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 |
| 4 | 0 | 2 | 6 | 70 | 30 | 20 | 30 | |

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

## 5. COURSE CONTENT DETAILS

| Unit | Major Learning Outcomes (in cognitive domain) | Topics and Sub-topics |
|---|---|---|
| **Unit I. Basics of Switching Systems and Telephone Networks** | 1a. Describe basics functions of a Switching systems.<br>1b. List the signalling tones used for the telephony<br>1c. Explain stored program control switching system<br>1d. Compare two stage and single stage network Switching network .<br>1e. Outline subscribe loop system<br>1f. Explain architecture of the switching network.<br>1g. Compare signalling techniques.<br>1h. Calculate network traffic.<br>1i. Evaluate quality of switching system<br>1j. Define Grade of service and blocking probability<br>1k. Draw the Block diagram of EPABX and explain. | 1.1 Switching Systems<br>1.1.1 Evolution of telecommunications<br>1.1.2 Elements of switching system<br>1.1.3 Switching network configurations<br>1.2 Signaling tones and DTMF signaling<br>1.3 Stored program control<br>1.3.1 Centralized<br>1.3.2 Distributed<br>1.4 Two stage networks and its comparison with single stage network<br>1.5 Subscriber Loop system<br>1.6 Switching Hierarchy and routing<br>1.7 Signalling techniques and their comparison<br>1.8 Network traffic load and parameters<br>1.9 Grade of service and blocking probability<br>1.10 EPABX |
| **Unit II Satellite Communication** | 2a. State Kepler's Laws of satellite motion orbital motion of satellite.<br>2b. Compare LEO,MEO and GEO<br>2c. Sketch the block diagram of satellite systems and explain each block.<br>2d. Describe working of satellite antennas.<br>2e. Draw the block diagram of satellite earth stations<br>2f. Discuss working of DTH receiver | 2.1 Introduction to satellite communication: Kepler's three laws of satellite motion in Orbits<br>2.2 Satellite Orbits: LEO,MEO and GEO<br>2.3 Basics of space craft: Power systems, Attitude and orbit control system, Telemetry tracking and Command, Communication subsystem, Spacecraft antenna<br>2.4 Earth station and receivers: Block diagram of an earth station, Direct broadcast satellites DTH receivers |
| **Unit III** | 3a. Summarise concept of ISDN | 3.1 ISDN concepts , standards, protocol architecture |

| Unit | Major Learning Outcomes (in cognitive domain) | Topics and Sub-topics |
|---|---|---|
| **Integrated Services Digital Networks (ISDN)** | 3b. Describe architecture of ISDN<br>3c. Write ISDN standards and signalling<br>3d. Explain need for broadband ISDN<br>3e. List ISDN services<br>3f. Discus need for broadband ISDN | 3.2 Transmission channels , Signaling: user level, network level<br>3.3 ISDN services: videotext, E-mail, digital fascimile, tele text, database access<br>3.4 Interworking<br>3.5 Broadband ISDN |
| **Unit IV Multimedia Communication Techniques and Standards** | 4a. Describe challenges of multimedia communication.<br>4b. Explain needs of multimedia processing.<br>4c. Identify applications of DMS.<br>4d. List multimedia standards for audio, video and image<br>4e. Describe ITV and VOD services<br>4f. Summarized ITU-T standardization. | 4.1 Multimedia Communications: Multimedia Communication Model, Elements of Multimedia Systems, User and, Network requirements.<br>4.2 Multimedia processing for communication: digital media, signal processing elements, digital audio file formats, digital image file formats, digital video file formats<br>4.3 Distributed Multimedia Systems: main features and resource management, Distributed Multimedia application ITV, VOD<br>4.4 Multimedia communication standards: MPEG approach to multimedia standardization, MPEG-1 encoding and decoding, MPEG-4 coding of audiovisual objects, JPEG 2000, ITU-T standardization of audiovisual communication systems |
| **Unit V Multimedia Communications Across Networks** | 5a. Explain the use of IP networks for multimedia communication.<br>5b. Describe use of DSL for multimedia communication.<br>5c. Compare DSL and ADSL for multimedia communication<br>5d. List use of wireless network for multimedia communication. | 5.1 Multimedia across IP Networks: audio and video transmission across IP network<br>5.2 Multimedia across DSLs, VODSL architecture, voice services, Multimedia across ADSL<br>5.3 Multimedia Across Wireless, Speech transmission in GSM, Video across GSM, Mobile ATM, Mobile IP, Wireless multimedia delivery |

| Unit | Major Learning Outcomes (in cognitive domain) | Topics and Sub-topics |
|---|---|---|
| | 5e. Summarize multimedia broad band broadcasting services. | 5.4 Digital video broadcasting: Data transmission using MPEG-2 and DVB, Broadband Multimedia Satellite systems, Digital television infrastructure for interactive multimedia Services, Interactive broadcast data (IDB) services |

## 6. 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 | Basics of Switching Systems and Telephone Networks | 12 | 04 | 04 | 04 | **12** |
| II | Satellite Communication | 12 | 04 | 04 | 02 | **10** |
| III | Integrated Services Digital Networks (ISDN) | 08 | 03 | 03 | 02 | **08** |
| IV | Multimedia Communication Techniques and Standards | 12 | 08 | 08 | 04 | **20** |
| V | Multimedia Communications Across Networks | 12 | 08 | 08 | 04 | **20** |
| **Total** | | **56** | **27** | **27** | **16** | **70** |

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

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

## 7. SUGGESTED LIST OF EXERCISES/PRACTICAL

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills **(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 outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of* ***Course Outcomes*** *related to affective domain. Thus over all development of* ***Programme Outcomes (****as*

*given in a common list at the beginning of curriculum document for this programme) would be assured.*
*Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes.*

| S. No. | Unit No. | Practical/Exercise (outcomes in psychomotor domain) | Approx. Hours Required |
|---|---|---|---|
| 1 | I | Demonstrate the complete call procedure using Telephone trainer. | 2 |
| 2 | I | Demonstrate the EPBX working | 2 |
| 3 | I | Develop a software program to configure various switching networks using MATLAB. | 2 |
| 4 | I | Estimate network traffic using MATLAB. | 2 |
| 5 | I | Calculate the blocking probability of any network using MATLAB. | 2 |
| 6 | II | Develop a code to observe the variations in the antenna look angles for the earth station antennas. (look_angle_variation.m) using MATLAB | 2 |
| 7 | II | Develop a code to analyze of link Budget Equation using MATLAB | 2 |
| 8 | II | Develop a code to analyze SNR of satellite Link using MATLAB | 2 |
| 9 | III | Prepare a presentation on architecture of ISDN and broadband ISDN | 2 |
| 10 | IV | Develop a code to convert the from any source video format to mobile compatible form MP4/3GP/AVI/FLV/GIF/MOV/SWF/MPG . | 2 |
| 11 | IV | Develop a code to convert from any source audio format to MP3/MPZ/WAV/FLAC/WMA etc Using format factory | 2 |
| 12 | IV | Develop a code to convert from any source picture format to JPG/PNG/BMP/GIF/TIF/ PCX/ TGA etc | 2 |
| 13 | IV | Develop a code to convert from DVD format to Video format using format factory | 2 |
| 14 | IV | Develop a code to convert from music CD to audio file using format factory | 2 |
| 15 | IV | Develop a code to convert DVD/CD to ISO/CSO using format factory. | 2 |
| 16 | IV | Develop a code to read audio file to WAV format in matrix form and write a noise version of the file using function such awgnc( ) of MATLAB(or related function of SCILAB ) | 2 |
| 17 | IV | Develop a code to change the two channel stereo audio WAV file into single channel mono audio WAV file using MATLAB or SCILAB. | 2 |
| 18 | IV | Develop a code to compare the performance of audio WAV file by changing sampling rate and no of bits of it using MATLAB or SCILAB. | 2 |
| 19 | IV | Develop a code to get information about a graphic file using imread( )function of MATLAB | 2 |

| S. No. | Unit No. | Practical/Exercise (outcomes in psychomotor domain) | Approx. Hours Required |
|---|---|---|---|
| 20 | IV | Develop a code to write image matrix in to a file using imwrite( )function of MATLAB | 2 |
| 21 | IV | Develop a code to enhance an image by intensity adjustment using imadjust ( ) function of MATLAB. | 2 |
| 22 | IV | Develop a code to add noise in an image using filter2 ( ) function of MATLAB. | 2 |
| 23 | IV | Develop a code to deblurr the image | 2 |
| 24 | V | Demonstrate the transmission of audio file (MP3/MPZ/WAV/FLAC/WMA) on IP based wired/wireless network. | 2 |
| 25 | V | Demonstrate the transmission of video file (MP4/3GP/AVI/FLV/GIF/MOV/SWF/MPG) on IP based wired/wireless network. | 2 |
| | | **Total** | **50** |

**Note:** Perform any of the practical exercises for a total of minimum 28 hours from above list depending upon the availability of resources so that skills related with the most of the outcomes in all the units are developed.

## 8. SUGGESTED LIST OF STUDENT ACTIVITIES

Following is the list of proposed student activities such as:

i. Visit digital telephone exchange of any service provider.
ii. Demonstrate the operation of EPABX of any organisation
iii. Visit satellite Earth station
iv. Prepare models of different satellites.
v. Visit Akashwani and prepare report on Audio recording, multiplexing and broadcasting.
vi. Visit Doordarshan Kendra and prepare report on video recording, multiplexing and broadcasting setup.

## 9. SPECIAL INSTRUCTIONAL STRATEGIES (If Any)

i. Show Video/ Animation film to develop the concept of satellite communication
ii. Arrange seminar on the recent communication trends related to the curricula
iii. Arrange visit to AIR and Doordarshan Kendra to explore the latest multimedia communication setup.
iv. Arrange visit to digital telephone exchange and mobile switching centre
v. Arrange expert lectures of engineers working in Durdarshan, satellite communication etc.
vi. Group discussion on multimedia file format

## 10. SUGGESTED LEARNING RESOURCES

### (A) List of Books:

| S. No. | Title of Books | Author | Publication |
|---|---|---|---|
| 1 | Telecommunication Switching Systems And Networks | Viswanathan, Thiagarajan | PHI Learning,New Delhi, latest edition |
| 2 | Electronic Communications | Roddy, Dennis Coolen John | Pearson Education, New Delhi, latest edition |
| 3 | Satellite Communications | Pratt, Bostian, Allnutt | Wiley,India, New Delhi, latest edition |
| 4 | Multimedia Communication systems | Rao, Bojkovic, Milovanovic | Pearson education |
| 5 | Principles of Multimedia | Parekh Ranjan , Ranjan | Tata McGraw-Hill, New Delhi, latest edition |
| 6 | An Introduction to Digital Multimedia | Savage T. M. , Karla E. Vogel | Jones & Bartlett Learning, New Delhi, latest edition |
| 7 | Multimedia communication systems | Fred Halsall | Pearson education, ,New Delhi, latest edition |
| 8 | Satellite communication | Dennis Roody | Tata McGraw-Hill, ,New Delhi, latest edition |

**B. List of Major Equipment/Materials**

i. Spectrum Analyzer ,10GHz
ii. Computers ,workstations
iii. Telephone trainer kit
iv. Mobile trainer kit
v. Satellite Trainer kit
vi. ISDN trainer kit

**C List of Software/Learning Websites**

i. MATLAB including and Simulink including satellite tool box, image processing tool box ,communication toolbox
ii. SCILAB
iii. Format factory
iv. FLV simulator for Video
v. Photoshop
vi. Windows movie maker
vii. Speech synthesizer

## 11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

**Faculty Members from Polytechnics**

- **Prof. S. N. Sampat**, Sr. Lecturer(EC) G .P. Gandhinagar
- **Prof. P. P. Gajjar**, Sr. Lecturer(EC) GGP, Surat
- **Prof. M. S. Dave**, Sr. Lecturer(EC) G. P.Ahmedabad
- **Prof.K. K. Shah** , Sr. Lecturer(EC) G. P. Rajkot

**Coordinator and Faculty Members from NITTTR Bhopal**

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