| RGPV (DIPLOMA WING) BHOPAL | OBE CURRICULUM FOR THE COURSE | FORMAT-3 | Sheet No. 1/5 |
|---|---|---|---|

| Branch | Opto-Electronics Engg(O01) | Semester | 4 |
|---|---|---|---|
| Course Code | 403 | Course Name | Digital Communication |

| Course Outcome 1 | Identify different digital signals andtheir parameters | Teach Hrs | Marks |
|---|---|---|---|
| Learning Outcome 1 | Classifydifferent digital signals **(Cognitive)** | 6 | 10 |
| Contents | Analog vs Digital Signal, Types of Digital signal: Binary, Tertiary, Octal, Hexadecimal, Advantages of Digital Communication, Baseband Transmission vs Broadband Transmission | | |
| Method of Assessment | External | | |
| Learning Outcome 2 | Define different parameters related to digital signals **(Cognitive)** | 8 | 10 |
| Contents | Bitrate, Bandwidth, Baud-rate, Transmission impairment: Attenuation, Distortion, Noise, BER, Jitter, Nyquist rate for noiseless channel, Shannon capacityfor noisy channel, Frequency and Time-Domain representation of periodic and non-periodic Digital Signal, frequency, bandwidth | | |
| Method of Assessment | External | | |
| Learning Outcome 3 | Analyze variousdigital signals **(Psychomotor)** | 6 | 10 |
| Contents | Time-Domain representation of periodic and non-periodic digital signal<br>Calculation of frequency & bandwidth and other parameters. | | |
| Method of Assessment | Internal | | |

| RGPV (DIPLOMA WING) BHOPAL | OBE CURRICULUM FOR THE COURSE | FORMAT-3 | Sheet No. 2/5 |
|---|---|---|---|

| Branch | Opto-Electronics Engg(O01) | Semester | 4 |
|---|---|---|---|
| Course Code | 403 | Course Name | Digital Communication |

| Course Outcome 2 | Explaindifferent steps of signal processingin PCM and digital line codes. | Teach Hrs | Marks |
|---|---|---|---|
| Learning Outcome 4 | Describe various signal processing methods in pulse code modulation **(Cognitive)** | 8 | 10 |
| Contents | Nyquist Sampling Theorem,Impulse sampling, Natural sampling-sample and hold operation –Quantization, Quantization levels, Quantization noise, PCM Encoding, Companding, Scrambling. Interleaving. Functional Block Diagram of PCM | | |
| Method of Assessment | External | | |
| Learning Outcome 5 | Compare various digital line codes **(Cognitive)** | 5 | 10 |
| Contents | Digital Line Codes: non return-to-zero(NRZ), return-to-zero (RZ), Manchester code | | |
| Method of Assessment | External | | |
| Learning Outcome 6 | VerifyPCM modulation /demodulation.**(Psychomotor)** | 6 | 10 |
| Contents | PerformPCM modulation /demodulation considering various signal processing stepsViz., Different type of Sampling, Quantization, Quantization levels, Quantization noise, Encoding. (On Trainer Kits/ Simulation Software) | | |
| Method of Assessment | External | | |

| RGPV (DIPLOMA WING) BHOPAL | OBE CURRICULUM FOR THE COURSE | FORMAT-3 | Sheet No. 3/5 |
|---|---|---|---|

| Branch | Opto-Electronics Engg(O01) | Semester | 4 |
|---|---|---|---|
| Course Code | 403 | Course Name | Digital Communication |

| Course Outcome 3 | Identifydifferent digital modulation, demodulation techniques and their application. | Teach Hrs | Marks |
|---|---|---|---|
| Learning Outcome 7 | Illustrate different digital modulation and demodulation techniques**(Cognitive)** | 8 | 10 |
| Contents | Digital modulation techniques with block diagram,ASK,FSKBPSK,GMSK. Digital Demodulation techniques with block diagram,ASK, FSK, BPSK, GMSK. | | |
| Method of Assessment | External | | |
| Learning Outcome 8 | Outline various applications of digital modulation and demodulation techniques.**(Cognitive)** | 6 | 10 |
| Contents | Applications of digital modulation techniquesin Mobile communication, Wi-Fi, Bluetooth, DTH, DSL Technologies, FTTH | | |
| Method of Assessment | Internal | | |
| Learning Outcome 9 | Verifydigital modulation and demodulation **(Psychomotor)** | 8 | 10 |
| Contents | Perform digital modulation – ASK, FSK, BPSK & GMSK and observe output waveform and verify it.<br>Perform digital demodulation – ASK, FSK, BPSK & GMSK and observe output waveform and verify it<br>(On Trainer Kits/ Simulation Software) | | |
| Method of Assessment | External | | |

| RGPV (DIPLOMA WING) BHOPAL | OBE CURRICULUM FOR THE COURSE | FORMAT-3 | Sheet No. 4/5 |
|---|---|---|---|

| Branch | Opto-Electronics Engg(O01) | Semester | 4 |
|---|---|---|---|
| Course Code | 403 | Course Name | Digital Communication |

| Course Outcome 4 | Analyze different Multiplexing and Multiple Access methods and their applications. | Teach Hrs | Marks |
|---|---|---|---|
| Learning Outcome 10 | Compare different Multiplexing and Multiple Access techniques.<br>**(Cognitive)** | 8 | 10 |
| Contents | Difference between Multiplexing and Multiple Access.<br>Need of multiplexing, Comparison of Time division multiplexing(TDM), Frequency division multiplexing(FDM), Orthogonal Frequency Division Multiplexing (OFDM).<br>Need of multiple Access, Comparison of Time Division Multiple access(TDMS), Frequency Division Multiple access(FDMA), Code Division Multiple access(CDMA) | | |
| Method of Assessment | External | | |
| Learning Outcome 11 | List out various applications of Multiplexing and Multiple Access techniques.<br>**(Cognitive)** | 6 | 10 |
| Contents | Application of FDM, TDM, OFDM in PSTN, Mobile communication, Wi-Fi, Bluetooth, DTH, DSL Technologies, FTTH<br>Application of FDMA, CDMA, OFDMA in Mobile communication, Wi-Fi, Bluetooth, DTH, DSL Technologies, FTTH. | | |
| Method of Assessment | Internal | | |
| Learning Outcome 12 | Verify different Multiplexing and Multiple Access techniques.<br>**(Psychomotor)** | 8 | 10 |
| Contents | Perform and verify different Multiplexing and Multiple Access techniques-FDM, TDM, OFDM, FDMA, TDMA,CDMA, OFDMA.<br>(On Trainer Kits/ Simulation Software) | | |
| Method of Assessment | Internal | | |

| RGPV (DIPLOMA WING) BHOPAL | OBE CURRICULUM FOR THE COURSE | FORMAT-3 | Sheet No. 5/5 |
|---|---|---|---|

| Branch | Opto-Electronics Engg(O01) | Semester | 4 |
|---|---|---|---|
| Course Code | 403 | Course Name | Digital Communication |

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|---|---|---|---|
| **Course Outcome 5** | Explain different Spread Spectrum methods and their applications. | Teach Hrs. | Marks |
| **Learning Outcome 13** | Compare different Spread Spectrum methods**(Cognitive)** | 8 | 10 |
| **Contents** | Advantages of spread spectrum systems – Pseudo noise sequence- Functional block diagram and operation of Direct sequence spread spectrum systems(DSSS) ,Functional block diagram and operation of Frequency hoppingspread spectrum system (FHSS) | | |
| **Method of Assessment** | External | | |
| **Learning Outcome 14** | Outline different applications of DSSS and FHSS**(Cognitive)** | 6 | 10 |
| **Contents** | Application of DSSS, FHSS in Mobile communication, Wi-Fi, Bluetooth, DTH, DSL Technologies, FTTH. | | |
| **Method of Assessment** | Internal | | |
| **Learning Outcome 15** | Simulate and verifyFHSS and DSSS. **(Psychomotor)** | 8 | 10 |
| **Contents** | Simulate and PerformDirect sequence spread spectrum systems (DSSS), Frequency hoppingspread spectrum system (FHSS) and verify it.<br>(On Trainer Kits/ Simulation Software) | | |
| **Method of Assessment** | Internal | | |

**Suggested List of Experiments*:**

| S.N. | Experiment | CO |
|---|---|---|
| 1 | Generate Digital Signals on Function Generator and observe waveforms and parameters of signal on CRO/DSO | CO403.1 |
| 2 | PerformPCM modulation /demodulation on Trainer Kits/ Simulation Software and observe waveforms on CRO/DSO | CO403.2 |
| 3 | PerformASK, FSK, BPSK, GMSK modulation on Trainer Kits/ Simulation Software and observe waveforms on CRO/DSO | CO403.3 |
| 4 | PerformASK, FSK, BPSK, GMSK demodulation on Trainer Kits/ Simulation Software and observe waveforms on CRO/DSO | CO403.3 |
| 5 | PerformFDM, TDM , OFDM multiplexing/ de-multiplexing on Trainer Kits/ Simulation Software and observe waveforms on CRO/DSO | CO403.4 |
| 6 | PerformFDMA, TDMA ,CDMA, OFDMA access methods on Trainer Kits/ Simulation Software and observe waveforms on CRO/DSO | CO403.4 |
| 7 | PerformFHSS, DSSS on Trainer Kits/ Simulation Software and observe waveforms on CRO/DSO | CO403.5 |

Ten experiments in a semester as per the discretion of the subject teacher.

**Major Equipment/Materials:**

| | |
|---|---|
| 1. | Cathode Ray Oscilloscope(CRO) |
| 2. | Digital Storage Oscilloscope(DSO) |
| 3. | Function generator |
| 4. | Spectrum analyser |
| 5. | Simulation Software |
| 6. | Computer |
| 7. | Trainer kits |

**Suggestions for Practicals:**

Experiments are expected to be performed

1. Using Trainer kits.
2. On simulation software **(**Scientech - Simtel Digital Communication System Simulation Software etc.
3. On virtual lab platforms available online

**Reference Books/Web Portals:**

| S.N. | Title | Author |
|---|---|---|
| 1 | Modern Digital and Analog Communication Systems | B.P. Lathi |
| 2 | Digital Communication | Sanjay Sharma |
| 3 | Fundamentals of Digital Communication | UpamanyuMadhow |
| 4 | Analog and digital communication | T.L Singal |
| 5 | Communication Systems: Analog and Digital | R .P Singh and S D Sapre |
| 6 | www.Nptel.ac.in | |
| 7 | www. Swayam.gov.in | |
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