### Teaching and Examination Scheme

#### Specialisation Digital Communication Engineering

**M.E. Ist Year (2015-2016)**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Period per week</th>
<th>Course Marks</th>
<th>Examination Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Theory T/P</strong></td>
<td><strong>50 75</strong></td>
<td><strong>175</strong></td>
<td><strong>575</strong></td>
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</tbody>
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#### First Semester

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Course Title (EC)</th>
<th>Period per week</th>
<th>Course Marks</th>
<th>Examination Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC-ME 34 A</td>
<td>Communication System Analysis (EC)</td>
<td>3 2 25</td>
<td>100</td>
<td>3</td>
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<tr>
<td>EC-ME 12 A</td>
<td>Information Theory (EC)</td>
<td>3 2 25</td>
<td>100</td>
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<tr>
<td>EC-ME 13 A</td>
<td>Digital Communication Systems (EC)</td>
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<td>EC-ME 14 A</td>
<td>Optical Communication (EC)</td>
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<tr>
<td>EC-ME 15 A</td>
<td>Satellite Communication (EC)</td>
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<tr>
<td>EC-ME 16 B</td>
<td>Communication System Lab (EC)</td>
<td>- 6 50</td>
<td>75</td>
<td>-</td>
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<td><strong>Total</strong></td>
<td></td>
<td>12 16 175</td>
<td>575</td>
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#### Second Semester

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<thead>
<tr>
<th>Subject Code</th>
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<tbody>
<tr>
<td>EC-ME 17 A</td>
<td>ISDN &amp; Broadband Networks (EC)</td>
<td>3 2 25</td>
<td>100</td>
<td>3</td>
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<tr>
<td>EC-ME 18 A</td>
<td>Computer Communications (EC)</td>
<td>3 2 25</td>
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<tr>
<td>Elective I</td>
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<td>3 2 25</td>
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<td>3</td>
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<tr>
<td>Elective II</td>
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<td>Elective III</td>
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<td>3 2 25</td>
<td>100</td>
<td>3</td>
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<tr>
<td>EC-ME 19 B</td>
<td>Telematics Lab (EC)</td>
<td>6 50</td>
<td>75</td>
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<tr>
<td><strong>Total</strong></td>
<td></td>
<td>15 16 175</td>
<td>575</td>
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**M.E. II Year (2016-2017)**

#### Third Semester

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Course Title</th>
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<th>Examination Hours</th>
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<tr>
<td>EC-ME 20 B</td>
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#### Fourth Semester

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<tbody>
<tr>
<td>EC-ME 21 B</td>
<td>Dissertation</td>
<td>-</td>
<td>-</td>
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**Grand Total of Marks**

450 + 1150 = 1600

### Elective Papers (Any Three)

- EC-ME 22 A Digital Signal Processing & Applications (EC)
- EC-ME 23 A Microwave Communication & Remote Sensing (EC)
- EC-ME 24 A Detection & Estimation Theory (EC)
- EC-ME 25 A Theory of Coding & Decoding (EC)
- EC-ME 26 A Digital Coding of Speech and Video Wave Forms (EC)
- EC-ME 27 A Digital Image Processing (EC)
- EC-ME 28 A Telecommunication Switching & Networks (EC)
- EC-ME 29 A Spread Spectrum Techniques (EC)
- EC-ME 30 A Radar System Analysis (EC)
- EC-ME 31 A Advance Antenna Theory (EC)
- EC-ME 32 A Mobile Communication Engineering (EC)
- MA-ME(EC) 33 A Mathematics (EC)
ME (EC) DIGITAL COMMUNICATION ENGINEERING
(First Semester)

EC-ME 34 A - COMMUNICATION SYSTEM ANALYSIS (EC)
Random Variables: Statistical Averages, Transformation of Random Variables
Performance of Baseband, PCM and delta modulator systems, Introductory study of spread spectrum modulation.

EC-ME 12 A - INFORMATION THEORY (EC)

EC-ME 13 A - DIGITAL COMMUNICATION SYSTEMS (EC)

EC- ME 14 A - OPTICAL COMMUNICATION (EC)
Introduction to theories of Optical propagation, Transmission characteristic of optical fibres-step. Indes fibres (Multimode and single mode), Graded index fibres Attenuation, Dispersion,
Scattering and Polarization, V-number-cutoff, No. of guided modes. Fabrication of optical fibres. Cables, Joints, Splices, couplers, Connectors.

Optical Sources: Absorption and emission of radiation Semiconductor materials, heterojunction.

LEDs: Surface Emitting Edge Emitting, Planar, Coupling Characteristics and drawback of LEDs.

Lasers: Optical Feedback and lasing action. Multimode single mode injection lasers, confinement, various structures, characteristics and drawbacks.

Optical Detector: Principle and working, p-n, p-i-n and APD photo diode, Responsivity, other technique for detection.

Optical communication Systems: Intensity modulation, Direct detection Transmitter-Receiver performance, consideration. Subcarrier intensity modulation and detection. Introduction to optical pulse and digital communication techniques, Line coding, Performance and design consideration of optical communication system. Power budgeting. Coherent communication, Multiplexing, Practical constraints to repeaters less transmission.

Introduction to Parameters, Estimation and characterization in optical communication systems.

Application of optical Communications.

**EC-ME 15 A - SATELLITE COMMUNICATION (EC)**


**EC-ME 17 A - ISDN & BROADBAND NETWORKS (EC)**

ISDN standards and architectures. The S/T and U interfaces ISDN protocols, Subscriber loop technologies.

ISDN terminal equipment. Evolution of BISDN

Broadband telecommunication technologies. SDH frame structure and synchronous multiplexing. ATM theory, protocols, switching and connectivity. Introduction to congestion
control and performance evaluation of ATM networks. ASONET structure, components and tributaries, synchronization in broadband networks.

**EC-ME 18 A - COMPUTER COMMUNICATIONS (EC)**


**Elective papers (any three)**

**EC-ME 22 A – DIGITAL SIGNAL PROCESSING AND APPLICATIONS (EC)**

Discrete Fourier Transformer for processing of filters. IIR and FIR digital filter design. State variable analysis and its applications in digital filter design, Multi rate signal processing, Short time Fourier transform and wavelet transform. IIR and FIR wiener filtering. Adaptive filtering gradient descent and recursive least square technique Para-metric and Non Parametric spectrum estimation. General study of the application of digital signals processing to spectrum, image and radar signals.

**EC-ME 23 A – MICROWAVE COMMUNICATION AND REMOTE SENSING (EC)**


Characterization of sub systems of line of sight communication system. Theory and system design of troposcatter communication system.


Data Processing of Microwave, Data applications of Passive and Active Microwave sensors for Ocean Land and Atmosphere from tower aircraft and space craft
EC-ME 24 A – DETECTION AND ESTIMATION THEORY (EC)

Hypothesis testing, Bayes, min-max and Nayman Pearson’s criteria, General gaussin problem. Detection and Estimation of continuous singles in white and coloured noise, Wiener-Hopf and Kalman Bucy filtering, sequential deduction, Introduction and Deduction in doubly dispersive channels application to radar

EC-ME 25 A – THEORY OF CODING AND DECODING (EC)

Review of linear algebraic concept regarding groups, rings fields and vector spaces, Linear block codes and their error deduction and correction capabilities Encoding and decoding of cycle codes, Error trapping, decoding and burst error corrections, BCH codes, Encoding and structure of convolutional codes, Maximum likelihood decoding and Viterbi decoding of convolutional codes, introductions to practical applications of error control codes

EC-ME 26 A – DIGITAL CODING OF SPEECH AND VIDEO WAVEFORMS (EC)

Characteristic of speech and image waveforms, analysis and synthesis of speech and radio signals, sampling and reconstructions of band limited waveforms Quantization audio and speech wave Forms, importance of bandwidth and bit-rate reduction Study of Redundancies, DCPM, delta modulation and adaptive delta modulation Introduction to encoding of other signals like ECG, EEG

EC ME 27 - A DIGITAL IMAGE PROCESSING (EC)

Digital image fundamentals, Image modal sampling and quantization, Elements of visual perception, Image transform FFT, Hear, Hadmard, Stent and cosine transforms, Differential filters in frequency domain, Compression schemes, Smoothing Edge enhancement, Image restoration, Inerse filter Wiener filter, constrained deconvolution and recursive filtering, texture analysis, Region sementation, Thresholding geometry and shape description

EC ME – 28 A – TELECOMMUNICATION SWITCHING AND NETWORKS (EC)

Multiplexing hierarchies. Analog and digital switching, Circuit switched, message switched and packet switched networks, Switching system controls and architecture, Switching System software. Time and space division switching. Integrated and hybrid Switching TASI and DSI, Interface to digital transmission facilities, Digital signal processing in digital switching, Telecommunication traffic analysis, Loss systems, blocking system and delay systems, Queueing
analysis. Problems associated with traffic imbalances. Services on telecommunication networks

**EC-ME 29 A - SPREAD SPECTRUM TECHNIQUES (EC)**

Theory of spread spectrum. Processing gain and jamming margin, Direct sequence spectrum spreading, Frequency hopping, Time hopping FM Chirp, Hybrid techniques, Coding for spread spectrum communication and ranging, Wideband carrier modulation, Analog and digital matched filter, Acquisition, tracking and synchronization, Spread spectrum communication transmitter and receiver, Application of spread spectrum.

**EC-ME 30 A - RADAR SYSTEM ANALYSIS (EC)**

Radar cross sections and its measurement simple and complex targets clutter cross sections for different types. Concepts of resolution and ambiguity, Pulse compression, Radar signal analysis for range accuracy and resolution, Radar signal detection and estimation techniques. The ambiguity function, large time BW signal their generation and matched filtering. Digital ambiguity function and digital signal processing as applied to, Radar principle of electronic beam steering, Synthetic aperture radar resolution analysis, satellite tracking radar systems.

**EC-ME 31 A – ADVANCE ANTENNA THEORY (EC)**

Parameters of Antennas, General solution of the fields, methods of reflectors with arbitrary shape-geometrical optics methods, current distribution methods aperture field method, linear planar and circular arrays-self and mutual impedances and finite diameter effects Broadband and frequency independent antennas, Geometric theory of diffraction aperture antennas and ground plan edge effects, Horn-slot, reflector and lens dielectric and metal antennas, Phased concept, Antennas synthesis and continuous sources.

**EC-ME 32 A – MOBILE COMMUNICATION ENGINEERING (EC)**

Theory of groups and fields: Definition of group, subgroup, examples of elementary properties of cosets, Lagrange's theorem, isomorphism, Cayley's theorem, conjugate elements, normal subgroup, quotient group, homomorphism, isomorphism theorems.

Definition of rings, fields, integral domain, subring, subfields, ideals, difference rings, polynomial rings, Euclidean domains, principal ideal ring.

Definition of vector space, subspace, linear combination of vectors, linear dependence and independence of vectors, quotient space. Direct sum of two subspaces, basis and dimensions of vector spaces. Definition of prime fields, extension of fields, separable and inseparable extensions, monomorphism, normal extension and fundamental theorem of Galois Theory.

Queueing Theory: Structure, technique and basic theory, Poisson and non-Poisson queues. Special non-Poisson cases, bulk queues, single server and many server queueing processes, telephone traffic process, process of servicing machines, a process of practical counting, the basic renewal theory, discrete and continuous cases, transient solution of M/M/P.

Stochastic: General Introduction, random sequences, renewal Markov chains, process in continuous time, Poisson process, the trunking problem, infinitely many channels, waiting lines for a finite number of channels, servicing of machines with one and many repairmen, the power supply problem.