Gondwana University, Gadchiroli

Scheme of Examination
&
Syllabus

For Semester Pattern with Credit Based System

in

M. Sc. Electronics

(Under the Faculty of Science)

Approved by the Board of Studies in Electronics

Effective from the session 2012-2013 and subsequently
Appendix-1

Scheme of teaching and examination under credit based semester pattern for M.Sc. Electronics

<table>
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<tr>
<th>Sr.No.</th>
<th>Semester</th>
<th>Theory Paper/Practical</th>
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Total Marks: 2500  Credits: 100

Note:
1. Minimum marks for passing 32 out of 80 in each theory paper
2. Minimum marks for passing 40 out of 100 in each practical
3. Minimum marks for passing 10 out of 25 in seminar
4. Minimum marks for passing 08 out of 20 in each internal(Int.) assessment
M. Sc. (Electronics)

Semester IV

Paper I (ELE 401): Electromagnetic Fields and Antennas

Unit I: Electromagnetic waves
The equation of continuity for time varying fields, Maxwell’s equations, EM waves in a homogeneous medium, wave equations for a conducting medium, conductors and dielectrics, Poynting’s theorem, interpretation of E x H, complex Poynting vector

Unit II: Antenna Basics
Basic radiation equation, radiation resistance, antenna patterns, half-power bandwidth, radiation intensity, directivity and gain, resolution, apertures, effective heights, Fri’s transmission formula, field zones, linear, elliptical and circular polarization

Unit III: Antenna types
The antenna family, short dipole antenna, antenna arrays, broad-side and end-fire arrays, linear arrays, folded dipole, Yagi-Uda array, helical beam antenna, horn antenna, rhombic antenna, parabolic reflectors

Unit IV: Antennas for mobile communications and antenna measurements
Antennas for terrestrial mobile communications, base station antennas, switched beam and beam forming antennas, antennas on cellular handsets, micro-strip lines and antenna
Antenna measurements: The reciprocity theorem, antenna ranges, compact antenna test ranges (CATR), instrumentation for measurement of radiation properties of antenna under test (AUT)

References:
2. Antennas: For All Applications: John D. Kraus and R. J. Marhefka, TMH, New Delhi
M. Sc. (Electronics)
Semester IV

Paper II (ELE 402): Digital Communication

Unit I: Signals and spectra
Classification of signals, energy and power signals, energy spectral density, power spectral density, unit impulse function, sifting property of the Dirac delta function, Fourier series, Parseval’s theorem, Fourier transforms, properties of Fourier transforms, convolution properties, graphical convolution

Unit II: Digital Communication system
Elements of digital communication system, the sampling theorem, aliasing error, PAM, PPM & PWM signals generation and detection
Pulse code modulation, uniform and non-uniform quantization, SNR, companding characteristics, Inter-symbol interference, Nyquist criteria of zero ISI, eye pattern

Unit III: Digital Modulation Techniques
Coherent binary modulation techniques, PSK, FSK, QPSK, MSK differential pulse code modulation, predictor, delta modulation, adaptive delta modulation, slope overload and granular noise, M-ary signaling

Unit IV: Information Coding
Measure of information, entropy, mutual information, Shannon’s coding theorem, channel capacity, capacity of Gaussian channel, source coding, Huffman code, channel coding, block codes, syndrome decoding, convolutional coding, code tree, spread spectrum communication: PN sequences, direct sequence and frequency hopping spread spectrum systems

Practicals:
1. Study of PCM circuit and quantization
2. Study of PAM, PWM and PPM circuits and detection of these signals
3. Study of a Delta modulator
4. Study of a DBPSK communication system
5. Study of an adaptive Delta modulator
6. Study of a convolutional encoder
7. Study of a PN sequence generator
8. Study of a spread spectrum direct sequence communication system

Books:
1. Digital communications: Bernard Sklar (Pearson Education, Asia Publ)
3. Analog and Digital Communications: Hwei Hsu (Schaum Outline MGH)

References:
1. Digital communications: Symon Haykin (John Wiley & Sons)
3. Digital communications: J. G. Proakis (MGH)
M. Sc. (Electronics)  
Semester IV  

Paper III (ELE 403): Microwave and Optical Communication

Unit I: Microwave Generators and wave guides  
- Failure of vacuum tubes at high frequency, Two cavity klystron, reflex klystron oscillator, magnetron oscillator, TWT amplifier, backward wave oscillator, GaAs oscillator;  
- Propagation of EM waves through wave guide, TE, TM and TEM waves

Unit II: Microwave components and Measurements  
- Microwave components: scattering matrix, attenuators, Tees, directional couplers, circulators, isolators, phase shifters, cavity resonators  
- Microwave measurements: Measurement of VSWR, phase shift, frequency, power, attenuation, dielectric constants of liquids and solids, Q of cavity

Unit III: Fiber optics  
- Principles of optical communication, single mode and multi mode fibers, step index, graded index, ray model, multi path dispersion, material dispersion, optical fiber as wave guide, fiber sources and detectors,

Unit IV: Manufacture and Measurements of fibers  
- Optical fiber cable, fiber joints, splices, couplers and connectors, measurement in optical fibers, attenuation measurement, dispersion measurement, refractive index profile measurement, transmission links, optical transmitters and receivers

Practicals:  
Practicals on X-band test bench  
1. Characteristics of reflex Klystron  
2. Attenuation Measurement  
3. Coupling and directivity of a directional coupler  
4. Standing wave plotting and measurement of guide wavelength  
5. Measurement of low VSWR and high VSWR  
6. Measurement of unknown impedance using Smith chart

Practicals on optical fiber  
1. Transmission characteristics of optical fiber link  
2. Attenuation measurement  
3. Dispersion measurement  
4. Refractive index profile measurements

Books:  
1. Microwave devices and Circuits: Liao  
2. Microwave Engineering: David Pozar  
3. Electronics and Radio Engineering: Terman  
5. Optical Fiber Communication : B. Keiser (MGH)  
7. Optical Fiber Systems: Kao (MGH)  
8. Fiber Optic Communication: D. C. Agrawal (A. H. Wheeler Co.)
M. Sc. (Electronics)  
Semester IV  
Paper IV (ELE 404): Mobile and Satellite Communication

Unit I: Cellular Concepts and Equalization
Cellular telephone system, frequency reuse, channel assignment and land off strategies, elements of cellular radio system design, switching and traffic, data links and microwaves, system evaluation, interference and system capacity, Improving coverage capacity; Fundamentals of equalization, space polarization

Unit II: Diversity, channel coding and GSM system for Mobile
Frequency and time diversity techniques, channel coding; service and features, GSM system architecture, GSM channel types, GSM frame structure, intelligent cell concept and applications; Features of handset, SMS, security; Interfacing of mobile with computer, application of mobile handset as modem, data storage device, multimedia device; Measurement of signal strength; Introduction to CDMA digital cellular standard

Unit III: Satellite Communication
Satellite orbits, frequencies, stabilization, orbital parameters, coverage area, work angle, Attitude and orbit control system, telemetry tracking and command power system; Satellite Link design: system noise temperature and G/T ratio, down link design, domestic satellite system; eclipse on satellite

Unit IV: Multiple Access Techniques
FDMA and TDMA, TDMA synchronization and timing, code division multiple access. Applicability of CDMA to commercial system, Earth's path propagation effects; satellite services for communication – Weather forecasting, remote sensing, direct to home (DTH) TV

Practicals:
1. Measurement of field strength – mobile towers  
2. Any suitable practicals on the above topics

Books:
M. Sc. (Electronics)
Semester IV
Project and Seminar

M. Sc.-II (Electronics)/Semester IV students will have project of 80 marks. It includes seminar on the project work of 20 marks, totaling 80 marks.

The Projects will be evaluated at the time of final examination, jointly by the external and internal examiners, by conducting viva and demonstration of the project work.

[Note: - Not more than 6 to 8 projects be evaluated by a single external examiner]

A copy of the project work be made available to the external examiner at least a day before the actual date of examination.

GUIDELINES FOR PROJECTS:
1. The Project experiment should be open ended
2. It may be based on any topics of the syllabus
3. It may be based on collection of data and then analysis leading to some meaningful conclusion
4. It may be based on review of a suitable research topic
5. It may be based on development of a new idea and design/fabrications
6. It may consist of hardware and software

PRESENTATION OF THE PROJECT:
Actual presentation format of the project may be decided by the teacher and the student. However, the following guidelines are given for general consideration.
1. At least four copies of the project be submitted.
2. It should be typed on sunlit bond A4 paper, single side with one and half/double - spacing.
3. The project should be of 30 to 40 pages.
4. It should be duly certified by the project supervisor and countersigned by the Head of the Department.
5. The project record should include information under the following/suitable heads:
   (a) Introduction,  
   (b) Theory (Related to the project),  
   (c) Experimental details,  
   (d) Observations and Graphs, if any,  
   (e) Results and discussion,  
   (f) References.

General Guidelines for Practical Examination (All Semesters):
(1) Each practical examination will have six hours duration.
(2) Each practical will have two parts, each of three hours duration.
(3) Practical’s will be based on the theory papers, prescribed in each semester.
(4) Each practical will be of 80 marks or 4 credits. The distribution of marks will be
   (i) Record Book 10 Marks,  
   (ii) Viva-voce 10 Marks,  
   (iii) Experiments 60 Marks.
(5) At the time of examination, students will have to submit the practical record book, duly signed by the concerned teacher and certified by the Head of the department.

Guidelines: Seminar for all semesters
Each student has to prepare a power point presentation/OHP presentation and deliver a seminar of about half an hour on topics from the theory papers, practical or activity based.

The seminar carries 25 marks or 1 credit. The record of the performance of the student will be maintained at the department and the copy certified by the Head should be provided at the time of examination.
PATTERN OF QUESTION PAPER

Max. Marks: 80  Time: 3 Hrs

Q1. Either
   Unit I  16 Marks
   Or
   Unit I  16 Marks

Q2. Either
   Unit II 16 Marks
   Or
   Unit II 16 Marks

Q3. Either
   Unit III 16 Marks
   Or
   Unit III 16 Marks

Q4. Either
   Unit IV 16 Marks
   Or
   Unit IV 16 Marks

Q5. Attempt the following.
   a) Unit I  4 Marks
   b) Unit II 4 Marks
   c) Unit III 4 Marks
   d) Unit IV 4 Marks

Note: -
1. Four units in each paper.
2. One question on each unit.
3. Fifth question on all units.
4. Maximum marks of each paper is 80.
5. Duration of question paper is of 3 hours.