SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

CHOICE BASED CREDIT SYSTEM (CBCS)
SEMESTER PATTERN

Post Graduate (PG) Programs unde r Faculty of Science
(Affiliated Colleges)
(w.e.f. Academic Year 2015-16)

SYLLABUS FOR M.Sc. PART-II EXAMINATION
M.Sc. ELECTRONICS
(SEMESTER PATTERN)

JUNE -2015

Draft Syllabus Prescribed for
M.Sc. Part-I and Part-II Examination in Electronics
(Semester Pattern)

There shall be total four semesters (Two for M.Sc. Part-I and Two for M.Sc. Part-II). There shall be four theory papers (100 marks each) semester Pattern and Four practical papers (100 marks each) Annual pattern. It is expected that the students should visit Research Laboratories and industrial establishments of repute.

M. Sc. Part – II Third Semester
Paper No. Title of the Theory Papers Marks

Paper No.	**Title of the Theory Papers**	**Credit**
EL-15	Power Electronics-II	4
EL-16	Digital communication	4
EL-17	Microwave Devices and Measurements	4
*EL-18	Advanced Microprocessor and Microcontroller	4
EL-19 Seminar	(25 marks)	Credits:1
Title of the Practical Papers		
EL-20	(Practical Course)	4
EL-21	(Practical Course)	4

M. Sc. Part –II Fourth Semester
Paper No. Title of the Theory Papers Marks

Paper No.	**Title of the Theory Papers**	**Credit**
EL-22	Instrumentation	4
EL-23	Simulation in Electronics:VHDL	4
EL-24	Microwave Communication	4
EL-25	Integrated Circuit Technique	4
EL-26 Seminar	(25 marks)	Credits:1
Title of the Practical Papers		
EL-27	(Practical course)	4
EL-28	Project work and Seminar on project	4

Tentative Distribution of Credits for PG under Science faculty:

Semester	Paper No	External (ESE)	Internal (CA)	Total
Sem. III	Paper-I (EL:15)	(75 marks) (25 marks)	(2Test : 15 marks+ Assignments :10 marks)	Credit: 4 (100 marks)
	Paper-II (EL:16)	(75 marks) (25 marks)	(2Test : 15 marks+ Assignments :10 marks)	Credit: 4 (100 marks)
	Paper-III(EL:17)	(75 marks) (25 marks)	(2Test : 15 marks+ Assignments :10 marks)	Credit: 4 (100 marks)
	Paper-IV(EL:18)	(75 marks) (25 marks)	(2Test : 15 marks+ Assignments :10 marks)	Credit: 4 (100 marks)
	Paper –V (EL:19) (Seminar)	(25 marks)	Credit: 1(25 marks)	Credit: 1
	Sem: III Credit: 17		**Total for**	**Credit: 17**
Sem. IV	Paper-I (EL:22)	(75 marks) (25 marks)	(2Test : 15 marks+ Assignments :10 marks)	Credit: 4 (100 marks)
	Paper-II(EL:23)	(75 marks) (25 marks)	(2Test : 15 marks+ Assignments :10 marks)	Credit: 4 (100 marks)
	Paper-III (EL:24)	(75 marks) (25 marks)	(2Test : 15 marks+ Assignments :10 marks)	Credit: 4 (100 marks)
	Paper-IV (EL:25)	(75 marks) (25 marks)	(2Test : 15 marks+ Assignments :10 marks)	Credit: 4 (100 marks)
	Paper –V (EL:26) (Seminar)	(25 marks)	Credit: 1(25 marks)	Credit: 1
	Sem: IV Credit: 17		**Total for**	**Credit: 17**
Lab Course Work (Annual Practical)	Practical Course Work –I(EL:20	(75 marks)	(25 marks)	Credit: 4 (100 marks)
	Practical Course Work –II (EL:21)	(75 marks)	(25 marks)	Credit: 4 (100 marks)
	Practical Course Work-III (EL: 27)	(75 marks)	(25 marks)	Credit: 4 (100 marks)
	Project work EL:28	(75 marks)	(25 marks)	Credit: 4 (100 marks)
	Total for Lab Course work(Annual)			**Credit: 16**
	Total for M.Sc. II Year: Sem. III+ Sem. IV + Lab Course work (Annual) Credit: 50			Credit: 50

Paper Setting Pattern for M. Sc.II (Sem III and IV)

All questions are compulsory and carry equal Marks

Q.1 a) ----------8
b) ----------7
OR Unit I
x) ----------8
y) ----------7

Q.2 a) ---------- 8
b) ----------7
OR Unit II
x) ----------8
y) ----------7

Q.3 a) ---------- -8
b) ----------7
OR Unit III

x) ----------8
y) ----------7

Q.4 a) ---------- 8
b) ----------7
OR Unit IV
x) ----------8
y) ----------7

Q.5 a) ---------- 8
b) ----------7
OR Unit V
x) ----------8
y) ----------7

M.Sc. III$_{rd}$ semester

Paper 15: Power Electronics – II (40 Hours) [Credit: 4]

1. Cycloconverters and Dual converters: (14)

The basic principle of operation, single-phase to single-phase cycloconverter, three phase half-wave cycloconverters, cycloconverter circuits for three-phase output, ring connected cycloconverter circuits, output voltage equation, control circuit, load-commuted cycloconverter.

Dual Converters:

Principle of dual converter (Ideal Dual Converter), practical dual converter, dual converter without circulating current operation, dual converter with circulating current Operation, dual mode dual converter.

2. Control of D.C. Drives: (08)

Basic machine equations, breaking modes, schemes for D.C. motor speed control, single phase separately exited drives, braking operation of rectifier controlled separately excited motor, single phase series D.C. motor drives, power factor improvement, three-phase separately excited drives, D.C. chopper drives, closed loop control of D.C. drives, phase locked loop (PLL) control of D.C. drives.

3. Control of A.C. Drives : (08)

Basic principle of operation, squirrel-cage rotor design, speed control of induction motors, stator voltage control, variable frequency control, rotor resistance control, slip power recovery scheme, synchronous motor drives.

4. Thyristor Control Circuits and Applications : (10)

Temperature control, illumination control, light-activated turn off circuit using DIAC- TRIAC,and LDR, OFF at dark circuit, automatic street lighting circuit using SCR, automatic battery charger using SCR, light operated SCR alarm, burglar alarm circuit using SCR, direct current circuit breaker using SCR, battery operated inverter circuit using power transistor, SCR-UJT operated timer circuit, over voltage protection, zero voltage switch, integral cycle triggering, switched mode supply (SMPS), uninterruptible Power supply (UPS), ARC welding, high voltage D.C. transmission.

References:

1. Power Electronics–M.D. Singh and K. B. Khanchandani, Tata McGraw-Hill Pub. Co. Ltd., New Delhi.
2. Industrial Electronics and Control–S.K. Bhattacharya and S. Chattarjee, Tata McGraw-Hill Pub. Co. Ltd., New Delhi.

Paper 16: Digital Communication (40 hours) [Credit: 4]

1. Basic Communication Principles: (11)

Bandwidth requirements, communication channel, signal to noise ratio, channel capacity, Shannon and Hartley law, communication via satellite, amplitude modulation, modulation index and its measurement, side bands, power relation, AM transmitter: different AM transmitter circuits, single sided and double sided band systems, vestigial side band systems.

2. AM Demodulations: (06)

FM and pulsed modulation: narrow band, wide band, FM sensation and demodulation, noise reduction, pulse amplitude modulation and its sampling, signal recovery, cross talk, sensation of PAM and PPM signals.

3. Sampling and Pulsed Code Modulation : (11)

Sampling theorem, pulse-code modulation (PCM), advantage of digital communicationquantization of signals, principle of progressive taxation, compander, transmission bandwidth and SNR, ATI carrier system, differential pulse-code modulation (DPCM), data modulation, adaptive data modulation (ADM), phase shift keying.

4. Digital Data Transmission: (06)

Digital data communication system, line coding, pulse shaping, scrambling, regenerative repeater, detection error, probability, M-ray communication, digital carrier systems, digital multiplexing.

5. Cellular Telephone (Mobile Radio) System: (06)

Spread spectrum analysis, (DS/SS), frequency hopping spread spectrum (FH/SJ), application of spread spectrum, transmission media, hybrid circuit, public switched telephone network (PJTN), FAX.

References :

1. Analog and digital communication – B.P. Lathi
2. Modern digital and analog communication system – B.P. Lathi, Oxford Uni. Prss.
3. Principles of communication system – Tank and Schilling (Tata MGH).
4. Analog and digital communication – H.P. Hsu, Shaum series.
5. Modern electronics communication –S. Miller (Wiley International).

Paper 17: Microwave Devices and Measurements (40 hours) [Credit: 4]

1. Microwave Tubes: (08)

Klystron, reflex klystron, magnetron-cylindrical and linear, traveling wave tubes (Helix type).

2. Microwave Solid State Devices: (16)

Tunnel diodes, bipolar transistors, JEFETs, MOSFETs

Transferred electron devices (TEDs):

Gunn diode, LSA diodes, Inp diodes.

Avalanche transit-time devices:

Read diode, IMPATT diode, TRAPATT diode, BARITT diodes.

3. Microwave Components: (07)

Wave-guide and modes of propagation, TE, TM and TEM modes, wave guide tees E-plane and H-plane tees, magic tees, isolator, attenuators, directional coupler, Circulators, phase shifter, microwave terminations and detectors.

4. Microwave Measurements: (09)

Measurements of power, attenuation, wavelength, frequency, impedance, phase shift, Q and VSWR, impedance measurement by network analyzer, TDR method.

References :

1. Microwave devices and circuit – Samuel Y. Liao, PHI
2. Microwave –K.C. Gupta, Wiley Eastern Ltd.
3. Microwave Engineering – Sanjeeva Gupta and others, Khanna Publishers.
4. Microwave circuit and passive devices – M.L. Sisodia and G.S. Raghuvanshi, Wiley Eastern Ltd.
5. Foundation for Microwave Engineering –Robert E. Collin, McGraw Hill Book Company.

Paper 18: Advanced Microprocessor and Microcontroller (40 hours) [Credit: 4]

1. 16 bit Microprocessor: (08)

Register organization of 8086, architecture, signal description of 8086, physical memory organization, general bus operation, I/O addressing capability, minimum mode 8086 system and timings, maximum mode 8086 system and timings.

2. 8086 Instruction Set and Assembler Directives: (08)

Machine language instruction formats, addressing modes of 8086, instruction sets of 8086, assembler directives and operators.

3. Assembly Language Programming: (08)

Program development steps, constructing the machine codes of 8086 instructions, assembly language programme developments tools, flags, jumps and WHILE-DO implementation, REPEAT-UNITL implementation, IF-THEN-ELSE writing and procedure, writing and using assembler macros.

4. Introduction To 8-bit Micro-controller 8051: (08)

8-bit microcontroller, architecture of 8051, signal description of 8051, register set of 8051, important operational features of 8051, memory and I/O addressing by 8051, interrupts of 8051, instruction set of 8051.

5. Introduction of 8-bit Microcontroller and Embedded Controller: (08)

Architecture of 16 bit microcontroller (MCS-96 or 80196), description of Intel 80196 family, general features of 80196, register set of 80196, description of Intel 80960 embedded microprocessor (block diagram), embedded version of 486 microprocessor, I/O processor, UPI 452 (Universal peripheral interface), co-processor (Intel 8087 , 80287, 80387).

References:

1. Microprocessor and Interfacing- Douglas V. Hall. (TMH).
2. Advanced Microprocessor and Peripherals- A.K. Ray and K.M. Bhurchandi (PHI).
3. Advanced Microprocessor and Interfacing- B. Ram (TMH).

M.Sc. IV semester

Paper 22: Instrumentation **(40 hours) [Credit: 4]**

1. Transducer: **(08)**

Introduction, electrical transducer, selecting a transducer, resistive transducer, resistive position transducer, strain gauges, resistance thermometer, thermistor, inductive transducer, differential output transducer, linear variable differential transducer (LVDT), pressure inductive transducer, capacitive transducer (pressure), piezo and photo electric transducer, photo-voltaic cell, semiconductor photo diode, the photo transistor, thermo electric transducer, frequency generating transducer.

2. Signal Conditioning: **(08)**

Introduction, operational amplifiers, basic instrumentation amplifier, applications of instrumentation amplifiers, chopper and modulated IC amplifiers, modulators.

3. Data Acquisition and Conversion: **(08)**

Introduction, objective of DAS, signal conditioning of the inputs, single channel data acquisition system, multi channel DAS, computer based DAS, D/A and A/D converters.

4. Induction Motors: **(06)**

Introduction, general design features, the rotating magnetic field, slip and rotor speed, rotor induced voltage and frequency, the rotor circuit, complete circuit diagram, characteristics.

5. Display Devices: **(02)**

LED, LID, nixie tube, LVD, seven-segment display.

6. Bio Medical Instrumentation: **(08)**

Introduction to man-instrument system, components of man-instrument system, physiological systems of the body, problems encountered in measuring a living system. Transducers for biomedical applications, sources of bioelectric potentials, electrodes for ECG, EEG and EMG.

Study of block diagram of ECG, EEG and EMG.

References:

1. Electronic Instrumentation- By H.S.Kalsi. Tata McGraw Hill Publication Co. Ltd.
2. Electric Machinery -By Peter F. Ryff, PHI.
3. Microprocessor with application in process control- By S.I. Ahson.
4. Power Electronics –By M.H. Rashid PHI.
5. Electronic Instrumentation –By S.K. Khedkar, Pune Vidyarth, Griha Prakashan, Pune.
6. Biomedical Instrumentation and Measurements –By Leslie Cromwell, Fred Weibell and Erich A. Pfeiffer (PHI).
7. Transducer Theory and Application –By Alloca J.A. and Stuart A., Reston Pub. Co. Inc. (A Prentice Hall Company, Reston).
8. Analog and Digital Control System –By Ramakant Gayakwad and Leonard Soholoff, PHI.
9. Biomedical Instrumentation –By Khandpurkar.
10. A course electrical and electronics measurement and instrumentation –A.K. Sawhney, Dhanpat Rai and sons.

Paper 23: Simulation in Electronics: VHDL **(40 hours) [Credit: 4]**

1. Introduction: **(02)**
VHDL history, capabilities, hardware abstraction

2. Basic Language Elements:
(A) Identifiers, data objects, data types: subtypes, scalar types, integer types, composite types, array types, record types, access types, incomplete types, file types.
(B) Operators: logical, relational, shift, adding, multiplying, miscellaneous.

3. Behavioral Modeling: **(06)**
Entity declaration, architecture body, process statement, variable assignment statement, signal assignment statement, wait statement, IF statement, case statement, null statement, loop statement, exit statement, next statement, assertion statement, report statement. nertial delay model, transport delay model, creating signal waveform, signal drivers, of transport delay and internal delay on signal drivers. Other sequential statement: multiple processes, postponed process. (10)

4. Dataflow Modeling: **(04)**
Concurrent signal assignment statement, concurrent Vs. sequential signal assignment, delta delay revisited, multiple drivers, conditional signal assignment statement, selected signal assignment statement, the UNAFFECTED value, block statement, concurrent assertion statement, value of a signal.

5. Structural Modeling: **(04)**
Component declaration, component instantiation, examples of parity generators, counters, resolving signal values.

6. Generics and Configurations: **(04)**
Generics, configurations specifications and declaration, default rules, conversion function, direct instantiation, increment binding.

7. Subprogram's and Overloading: **(04)**
Subprograms, functions, procedures, declarations, subprogram overloading, operator overloading, signatures, default values for parameters.

8. Packages and Libraries: **(06)**
Package declaration, package body, design file, design libraries, order of analysis, implicit visibility, explicit visibility, library clause, use clause.

References:
VHDL Premier (third edition) –J.Bhaskar, Pearson Education Asea Reference Book.
VHDL (Third Edition) –Douglas Perry, Tata McGraw Hill.

Paper 24: Microwave Communication **(40 hours) [Credit: 4]**

1. Microwave Antennas: **(08)**

Antennas fundamentals: gain, bandwidth, impedance, directivity, horn antennas, antennas with parabolic reflectors, feed system, limitations, lens antenna-general principles, practical consideration, microwave antennas.

2. Propagation of Microwave: **(07)**

Space wave propagation over ideal flat earth, effect of curvature of an ideal earth, various other considerations in space wave propagation, atmospheric effects in space wave propagation, refraction of rays and the radio horizon, duct propagation, tropospheric scattering and reflection, fading of space wave signals.

3. Broad-band Communications: **(10)**

Time division multiplexing, frequency division multiplexing-3 channel and 12 channel carrier systems, microwave links, line of sight links, tropospheric links-quadruple diversity systems, satellite communications-choice of orbit FDMA, TDMA, SPADE.

4. Satellite in Communication and Global TV Service: **(07)**

Introduction, satellite links, eclipses, orbit and inclination, satellite construction, satellite communication frequencies, different domestic satellites, telemetry.

5. Rader Systems: **(08)**

Basic principles, radar equation, factor influencing maximum range, effects of noise, power and frequencies used in radar, types of radar, basic pulsed radar system, modulators, receiver bandwidth requirements, factor governing pulse characteristics, duplexer, moving target indicator, tracking radar systems and search radar systems.

References:

1. Microwave Engineering –Sanjeeva Gupta and others, Khanna Publishers. (For topics- 1,2 & 5)
2. Principles of Communication Engineering –Anokh Singh, S.Chand & Co. Pvt.Ltd. (For topic- 3)
3. Communication Electronics –N.D.Deshpande, D.A.Deshpande and P.K.Rangole, Tata McGraw Hill Pub. Co. Ltd. (For topic- 4)
4. Electronic Communications –Denis Roddy and John Coolean, Prentice Hall of India Pvt. Ltd.
5. Electronic communication systems –George Kennedy, McGraw Hill Book Company.
6. Satellite Communication –Robert M. Gagliardi, CBS Publishers & Distributors.
7. Introduction to Radar Systems –Merill I. Skolnik, McGraw Hill Book Co.

Paper 25: Integrated Circuit Techniques **(40 hours) [Credit: 4]**

1. Materials for Integrated Circuits: **(05)**

Classification of IC, electronic grade silicon, crystal growth, Czochralski and float zone crystal growing methods, silicon shaping, lapping, polishing and wafer preparation, vapor phase epitaxy oxidation thermal dry and wet plasma oxidation.

2. Integrated Circuits Fabrication Technology: **(10)**

Optical lithography, photo mask, photo resist and process, contact and proximity printing, limitations of optical lithography, idea of electron, mask generation, electron optics, idea of an X-ray lithography, wet chemical etching, reactive plasma etching, D.C. plasma excitation, AC plasma excitation, equivalent circuits.

3. Thin Film for Microelectronics: **(05)**

Evaporation theory, physical vapor deposition methods, design construction of high vacuum coating units, flash electron beam evaporation system, idea of dc and r.f. sputtering system.

4. Integrated Circuit Fabrication: **(05)**

Doping by diffusion, ion implantation, neutron doping monolithic integrated circuit, fabrication of integrated resistors and capacitors and their equivalent circuit, integrated inductor.

5. Microelectronic Fabrication: **(15)**

Fabrication of monolithic diodes in various configuration, fabrications of integrated transistors, idea of buried layer fabrication, monolithic circuit layout and design rules fabrication, monolithic circuit layout and design rules, isolation methods, monolithic FET, MOSFET processing, advantages and limitation of MOS devices, idea of HEMT (high electron mobility transistor), CCD, MOS integrated circuit, large and medium scale integration, hybrid integrated circuit.

References:

1. Integrated Electronics –Milliman and Taub
2. Microelectronics –Milliman and Gros
3. Thin Film Phenomena –K.L. Chopra
4. Hand Book of Thin Film –Marshel and Glang
5. VLSI Technology –S.M. Sze.