MAHATMA GANDHI UNIVERSITY

KOTTAYAM

M Sc PROGRAMME

IN

ELECTRONICS

(Affiliated Colleges)

REGULATIONS, SCHEME AND SYLLABUS

(Effective from 2012 Admissions)

Mahatma Gandhi University, Kottayam

Board of Studies In Electronics (PG)

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Preface

The P.G syllabus inElectronics is restructured to suite the credit and semester system to be followed by the affiliated colleges under M.G University, Kottayam, from the academic year 2012-2013. Now as the continuation of the credit and semester system being followed in the U.G courses in the university, the present restructuring of P.G curriculum becomes inevitable. In the restructuring of the P.G syllabus, the board of studies has taken efforts to offers in depth knowledge of the subject starting from its basic concepts to the state of art technologies in use today. Students are also provided extensive laboratory training on the course content and the current requirements of industries and R&D. the course is designed with a view to catering to the present day requirements in industries, R&D field higher studies and self-employment.

The Board of studies acknowledges the contributes from teaching members of all the affiliated colleges.

Prof. Mathew C Mathew
Chairman,
P.G Board of studies in electronics
M.G University
Kottayam

M.Sc. PROGRAMME IN ELECTRONICS 2012

(Affiliated Colleges)

1. Eligibility

The eligibility for admission to M Sc Electronics programme in affiliated institutions under Mahatma Gandhi University is a B Sc Degree with Electronics/Physics one of the subjects (Main or Subsidiary) with not less than 55% marks in optional subjects.

Note: Candidates having degree in Electronics/Electronics Equipment and Maintaince/Physics shall be given a weightage of 20% in their qualifying degree examination marks considered for ranking for admission to M Sc(Electronics).

2. Admission

The admission to the M Sc programme shall be as per the rules and regulations of the University.
Students admitted under this programme are governed by the Regulations in force.

3. Programme Structure and Duration

The duration of the programme shall be 4 semesters. The duration of each semester shall be 90 working days. Odd semesters from June to October and even semesters from December to April. There shall be one month semester breaks each in November and May.

A student may be permitted to complete the programme, on valid reasons, within a period of 8 continuous semesters from the date of commencement of the first semester of the programme.

The programme shall include two types of courses, Core courses and Elective Courses .

There will be four core courses and one practical course per semester for the first three semesters. In the last semester there will be one core course, two elective courses to be selected from two separate groups and one project. At the end of the programme, there will be a comprehensive viva-voce which covers questions from all courses in the programme.

4. Attendance

The minimum requirement of aggregate attendance during a semester for appearing for the end semester examination shall be 75%. A student who does not satisfy the requirements of attendance shall not be permitted to take the end Semester examinations.

5. Promotion

A student who registers for the end semester examination shall be promoted to the next semester.

6. Examinations

There shall be University examination at the end of each semester.
Practical examinations shall be conducted by the University at the end of each semester.
Project evaluation and Viva -Voce shall be conducted at the end of the programme only.
Practical examination, Project evaluation and Viva-Voce shall be conducted by two external examiners and one internal examiner.
End-Semester Examinations: The examinations shall be normally at the end of each semester.
There shall be one end-semester examination of 3 hours duration in each lecture based course and practical course.

7. Evaluation and Grading

Evaluation: The evaluation scheme for each course shall contain two parts; (a) internal evaluation and (b) external evaluation. 25% weightage shall be given to internal evaluation and the remaining 75% to external evaluation and the ratio and weightage between internal and external is 1:3. Both internal and external evaluation shall be carried out using Direct grading system.

Internal evaluation: The internal evaluation shall be based on predetermined transparent system involving periodic written tests, assignments, seminars and attendance in respect of theory courses and based on written tests, lab skill/records/viva and attendance in respect of practical courses. The weightage assigned to various components for internal evaluation is as follows.

Components of Internal Evaluation

	Component	Weightage
i)	Assignment	1
ii)	Seminar	2
iii)	Attendance	1
iv)	Two Test Papers	2

Letter Grade	Performance	Grade Point (G)	Grade Range
A	Excellent	4	3.50 to 4.00
B	Very Good	3	2.50 to 3.49
C	Good	2	1.50 to 2.49
D	Average	1	0.50 to 1.49
E	Poor	0	0.0 o 0.49

Grades for Attendance

% of attendance	**Grade**
>90%	A
Between 85 and 90	B
Between 80 and below 85	C
Between 75 and below 80	D
< 75	E

Assignment

Components	Weight
Punctuality	1
Review	1
Content	2
Conclusion	1
Reference	1

Seminar

Components	Weights
Area / Topic selected	1

Review / Reference	1
Content	2
Presentation	2
Conclusion	1

Practical – Internal

Components	Weights
Attendance	1
Laboratory Involvement	2
Written / Lab Test	2
Record	2
Viva-voce / Quiz	1

Practical – External

Components	Weights
Design and Coding	2
Output	2
Record	2
Viva-voce	1

To ensure transparency of the evaluation process, the internal assessment grade awarded to the students in each course in a semester shall be published on the notice board at least one week before the commencement of external examination. There shall not be any chance for improvement for internal grade.

The course teacher and the faculty advisor shall maintain the academic record of each student registered for the course which shall be forwarded to the University through the college Principal and a copy should be kept in the college for at least two years for verification.

External evaluation: The external Examination in theory courses is to be conducted by

the University with question papers set by external experts. The evaluation of the answer scripts shall be done by examiners based on a well-defined scheme of valuation. The external evaluation shall be done immediately after the examination preferably through Centralized Valuation

8. Direct Grading System

Direct Grading System based on a 5 - point scale is used to evaluate the performance (External and Internal Examination of students)

DIRECT GRADING SYSTEM

Letter Grade	Performance	Grade point(G)	Grade Range
A	Excellent	4	3.5 to 4.00
B	Very Good	3	2.5 to 3.49
C	Good	2	1.5 to 2.49
D	Average	1	0.5 to 1.49
E	Poor	0	0.00 to 0.49

The overall grade for a programme for certification shall be based on CGPA with a 7-point scale given below

CGPA	Grade
3.80 to 4.00	A+
3.50 to 3.79	A
3.00 to 3.49	B+
2.50 to 2.99	B
2.00 to 2.49	C+
1.50 to 1.99	C
1.00 to 1.49	D

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A separate minimum of C Grade for Internal and External are required for a pass for a course. For a pass in a programme a separate minimum Grade C is required for all the courses and must score a minimum CGPA of 1.50 or an overall grade of C and above.

Each course is evaluated by assigning a letter grade (A, B, C, D or E) to that course by the method of direct grading. The internal (weightage =1) and external (weightage =3) components of a course are separately graded and then combined to get the grade of the course after taking into account of their weightage.

A separate minimum of C grade is required for a pass for both internal evaluation and external evaluation for every course.

A student who fails to secure a minimum grade for a pass in a course will be

permitted to write the examination along with the next batch.
There will be no supplementary examinations.

After the successful completion of a semester, Semester Grade Point Average (SGPA) of a student in that semester is calculated using the formula given below. For the successful completion of semester, a student should pass all courses and score a minimum SGPA of **1.50.** However, a student is permitted to move to the next semester irrespective of her/his SGPA.

For instance, if a student has registered for 'n' courses of credits C1, C2 ……,Cn in a semester and if she/he has scored credit points P1, P2……,Pn respectively in these courses, then SGPA of the student in that semester is calculated using the formula.

SGPA= (P1+P2+…….+Pn)/ (C1+C2+……+Cn)

CGPA = [(SGPA)1*S1 + (SGPA)2*S2 + (SGPA)3*S3 + (SGPA)4*S4]/ (S1+S2+S3+S4)

Where S1, S2, S3, and S4 are the total credits in semester1, semester2, semester3 and semester4.

9. Pattern of Questions

Questions shall be set to assess knowledge acquired, standard application of knowledge, application of knowledge in new situations, critical evaluation of knowledge and the ability to synthesize knowledge. The question setter shall ensure that questions covering all skills are set. He/She shall also submit a detailed scheme of evaluation along with the question paper. A question paper shall be a judicious mix of short answer type, short essay type / problem solving type and long essay type questions.

Weight : Different types of questions shall be given different weights to quantify their range as follows :

Sl. No.	Type of Questions	Weight	Number of questions to be answered
1	Short Answer type questions (not exceeding 1 page)	1	5 out of 8
2	Short essay / problem solving type questions (not exceeding 2 pages)	2	5 out of 8
3	Long Essay Type questions	5	3 out of 6

The Final Grade Card issued at the end of the final semester shall contain the details of all courses taken during the entire programme including those taken over and above the prescribed minimum credits for obtaining the degree. The Final Grade Card shall show the CGPA and the overall letter grade of a student for the entire programme.

CURRICULUM DESIGN ABSTRACT

Semester I

MES 1C1 - Electronic Devices and Circuit Design

MES 1C2 - Modern Communication Systems

MES 1C3 - Advanced Networks and Systems

MES 1C4 - MEMS and Power Electronics

MES 1P5 - Lab I Advanced Electronics Lab and Power Electronics Lab

Semester	Course	Teaching Hrs.		Credit	Total Credits
		Theory	Practical's		
I	MES 1C1	5	-	4	19
	MES 1C2	4	-	4	
	MES 1C3	4	-	4	
	MES 1C4	4	-	4	
	MES 1P5	-	8	3	
II	MES 2C1	4	-	4	19
	MES 2C2	4	-	4	
	MES 2C3	4	-	4	
	MES 2C4	4	-	4	
	MES 2P5	-	9	3	
III	MES 3C1	4	-	4	19
	MES 3C2	4	-	4	
	MES 3C3	4	-	4	
	MES 3C4	4	-	4	
	MES 3P5	-	9	3	
IV	MES 4C1	6	-	4	23
	MES 4EA*	5	-	4	
	MES 4EB*	5	-	4	
	Project	-	9	8	
	Viva-Voce	-		3	

SEMESTER I

MES 1C1 Electronic Devices and Circuit Design

MODULE 1:DIODES AND TRANSISTORS

PN Junction Diodes, Zener Diode, LED ,Tunnel Diode, Rectifiers, Biasing:- BJT,FET;MOSFET: Enhancement ,Depletion Types

MODULE 2:OPERATIONAL AMPLIFIER

Introduction,Charrecterstics,Inverting and Noninverting Amplifier; Applications:- Integrator,Differentiator,Schimitt Trigger,Zero crossing Detector,Phase Locked Loop,Level Detector ,Window Detector,Time marker Generator,Phase detector,

MODULE 3:FILTER AND WAVE GENERATOR

Filters:- First order low pass filter,Second order low pass filter,High pass filter and Second order band pass filter,Narrow band and wide band pass filter,Band rejection filter,notch filter and Band rejection filters

Astable and Monostable multivibrator,Traingular wave Generator,sine wave Generator,Phase shift and wien bridge oscillator,

MODULE 4:DIGITAL IC APPLICATIOS

Number system,Boolean Algebra,logic gates,combinational and sequential circuits,Synchronous and Asynchronous circuits,Digital IC's and Applications, Decade counter,Decoder,Parity Generator /Checker, sequence generatot,pattern detector

TEXT BOOKS

1. Electronic Devices and Circuit Theory, ROBERT BOYLESTAD,LOUIS NASSHELSBY.
2. Linear Integrated Circuits, D ROY CHOUDHURY
3. Op-amps and linear integrated circuits, RAMAKANT A. GAYAKWAD
4. Operational amplifiers and linear integrated circuits, ROBERT F. COUGHLIN, FREDERICK F. DRISCOLL
5. Digital and Analog techniques, G N NAVANEETH
6. Digital Integrated Electronics, HERBERT TAUB, DONALD SCHILLING

MES 1C2 **MODERN COMMUNICATION SYSTEMS**

Module 1. Digital Communication

Digital Modulation Techniques—Introduction—Pulse Code Modulation—Sampling Theorem—Quantization—Quantization Noise—Encoding—Generation and Reception—Noise in PCM Systems—Companding—DPCM—ADPCM--Delta Modulation—Digital Transmission Techniques—ASK—FSK—PSK—QPSK—DPSK—MSK—Time Division Multiplexing and Digital T1Carrier Systems.

Module 2.Fiber Optics Communication

Introduction--Total Internal Reflection-- Critical Angle and Acceptance Angle-- Fiber Classification:- Step Index, Graded Index; Modes, Cutoff wave length—Absorption--Scattering Losses--Core and Cladding Losses--Signal Distortion in Optical Wave guides:- Information capacity determination, Group delay, Material dispersion, Wave guide dispersion, Intermodal distortion--Lencing schemes for coupling improvements--Fiber endface preparation--Fiber Splicing-- Optical fiber connectors.

Module 3.Mobile Communication

Evolution of Mobile Communication—Mobile Radio System Around the World—Cordless Telephone System—Cellular Telephone System—How a Cellular Telephone Call is Made—Trends in Cellular Radio Communications—2G,2.5G and 3G Cellular Networks—WLL and WLAN—The Cellular Concept—Frequency Reuse—Channel Assignment Strategies—Handoff Strategies—Interference and System Capacity—Improving Coverage and Capacity in Cellular Systems—Propagation Problems:-Path Losses, Multipath Fading—Multiple Access Techniques:-FDMA,TDMA,CDMA,SDMA.

Module 4.Satellite Communication

Satellite Communication Fundamentals—Satellite Orbits—Satellite Positioning—Frequency Allocations—Antennas—Power Systems—Attitude Control—Satellite Station Keeping—Polarization—Transponders—Digital Satellite Communication Techniques—Multiple Access Techniques—Geostationary Satellite communication—VSAT—Satellite Path/Link Budget—Earth Stations—Satellite TV Systems.

Module 5. Radar Systems

Basic Principles and Radar Systems—Radar Performance Factors—Radar Range Equation--Pulsed Radar Systems—Antennas and Scanning—Display Methods—Moving Target Indication—Radar Beacons—CW Doppler Radar—Frequency Modulated CW Radar—Phased Array Radars—Planar Array Radars--Radar Coolant.

Text Books

1. Electronics Communication Systems by Wayne Thomasi, Pearson Publication, 5th Edition, (Module-1).
2. Optical Fibre Communications by Gerd Keiser(Module-2).
3. Wireless Communication Principles and Practice by Theodore S Rappaport, Person Publication, 2nd Edition, (Module-3).
4. Telecommunication Transmission Systems by Robert G Winch,McGrawHill Publication,2nd edition,(Module-4).
5. Electronic Communication Systems by Kennedy/Davis, Mc Graw Hill Publication, 4th edition,(Module-5).

Reference Text Books

1. Electronic Communications by Roody/Coolen, ,Pearson Publication,4th edition.
2. Satellite Communications by Dennis Roddy,Mc Graw Hill Publication,3rd edition.
3. Introductions to RADAR Systems by Skolnik, McGraw Hill, 3rd edition

MES 1C3 ADVANCED NETWORKS AND SYSTEMS

Module I

Review of basic circuit concepts

Circuit elements and Kirchoff's laws, Review of network theorems- Superposition Theorem, Substitution Theorem, Compensation Theorem, Thevenin's, Norton's, Millman's, Maximum Power Transfer theorem, Reciprocity Theorem.

Module II

Properties of Signals and Systems.

Characteristics of signals- Unit step function, Impulse and Ramp functions. Linearity-Time invariance, Stability and Causality- Special properties of Linear Time Invariant systems- Relation between Transfer function and impulse response- Network functions- Poles and Zeros- Pole-zero plot. Electrical systems- Mechanical systems- D'ALEMBERT'S Principle- Analogy systems- Force voltage analogy- Force current analogy.

Module III

Laplace and Fourier Transform Analysis

Network Analysis using Laplace Transform- Laplace transformation- Inverse Laplace Transformation- Important theorems regarding Laplace Transformation- Applications of Laplace Transformation in analyzing simple series and parallel networks (RL, RC and RLC circuits)- Laplace and Fourier Transforms of different signal waveforms.

Module IV

Passive network synthesis

Hurwitz polynomials- Positive real functions- Synthesis of RL, LC and RC networks by I^{st} and II^{nd} Foster and Couer methods.

Text Books

1. Network and systems, ROY CHOUDHARY
2. Network Analysis, G.K MITHAL
3. Circuits and Networks, A. Sudhakar,SHYAM MOHAN
4. Basic Circuit Theory, DESOR,KUO
5. Network Analysis, VAN VALKENBERG
6. Network Lines and Fields, RYDER
7. Principle of Network Synthesis, , VAN VALKENBERG

MES 1C4 **MEMS AND POWER ELECTRONICS**

MODULE I: OVERVIEW AND WORKING PRINCIPLES OF MEMS

MEMS and Microsystems – Typical MEMS and Microsystems products – Microsystems and Microelectronics –Miniaturization – Applications of Microsystems –Micro sensors, Micro actuation, Micro grippers, Micro motors, Micro accelerometer.

MODULE II: FABRICATION & MICROSYSTEM DESIGN

Ions and Ionization – Doping – Diffusion process – Scaling Laws for Electrical design –Substrate and wafers – Silicon as a substrate – Silicon compounds – Piezoresistors –Piezocrystals - Photolithography – Ion implantation – Diffusion – Oxidation – PVD – Etching –Surface micro aching – LIGA process - Microsystem Design Considerations – Use of CAD tool in Microsystems design.

MODULE III: POWER ELECTRONIC DEVICES & CIRCUITS

Review of operations: SCR, TRIAC, DIAC, IGBT, Power Diodes, MOSFET and UJT. Thyristor communication techniques: Introduction – Natural commutation –Forced commutation – Self commutation – Impulse commutation – Response pulse commutation – External pulse commutation – complementary commutation. Controlled Rectifiers: Principle of Phase controlled converter – Single-Phase full converter –Single-phase semi converter – Principle of Three phase half wave converter.

MODULE IV: AC VOLTAGE CONTROLLER AND DC CHOPPERS

AC Voltage Controller: Introduction – Principle of On / Off Control – Principle of Phase Control – Single Phase Bi-Directional Controllers with Resistive Loads - Cyclo Converters – Single Phase Cyclo converters.

DC Choppers: Introductions – Principles of Step down Operation – Step down With RL load –Principle of Step up Operation-Switch Mode Regulators: Buck Regulator – Boost Regulator –Buck Boost Regulator – Cuk Regulator.

Inverters: Introduction – Principle of Operation – Single Phase Bridge Inverter – Three-Phase Inverter – PWM voltage control.

TEXT BOOKS

1. “MEMS & Micro Systems Design and Manufacture” – Tai-Ran-Hsu, TMH, 2002

Edition.

2. “Power Electronics, Circuits, devices and Applications”, MUHAMMED RASHID,

Prentice Hall Edition, 2nd Edition, 1999.

3. “Power Electronics”,SEN

MES 1P5 Advanced Electronics Lab and Power Electronics Lab

ADVANCED ELECTRONICS LAB

PART 1-DIGITAL LAB

1. Shift register using IC.
2. Ripple counter using IC.
3. Ring counter using IC.
4. Decade counter using IC.
5. A/D Converter
6. D/A Converter

PART 2-OP AMP LAB

7. Operational Amplifiers Characteristics
8. Design of filters (low pass, High pass, Band pass, Band Rejection, Notch)
9. Wave Generators (Sine Wave, Triangle and Square wave)
10. Wave shaping circuits and Precision Rectifiers
11. Schimmit Trigger
12. Multivibrators
13. Log amplifiers

PART 3-Power Electronics Lab

14. SCR Characteristics
15. TRIAC Characteristics
16. Single Phase Inverter
17. UJT Relaxation Oscillator
18. Commutation Techniques

PART 4-Communication Lab

19. AM
20. FM
21. VCO & Frequency Multiplier
22. PCM
23. Time Division Multiplexing
24. BFSK

Note: Choose any 15 experiments from above list