CMJ UNIVERSITY, SHILLONG

REGULATION FOR MSC ELECTRONICS

Duration – Two Years

Eligibility - B.Sc. with relevant subject or its equivalent

Scheme of Distribution of Marks

Sr. No.	First Year	Internal Assessment Marks	Term End Examination	Total Marks	Passing Marks
1	Mathematics	30	70	100	40
2	English Communication	30	70	100	40
3	Environmental Engineering	30	70	100	40
4	Advanced Control Systems	30	70	100	40
5	It Tools And Applications	30	70	100	40
6	Electronic Networking	30	70	100	40
7	PRACTICAL-I				
8	PRACTICAL-II				
Sr. No.	Second Year	Internal Assessment Marks	Term End Examination	Total Marks	Passing Marks
1	Advanced Communication Systems	30	70	100	40
2	Advanced Microprocessor	30	70	100	40
3	Electromagnetic Waves	30	70	100	40
4	Computer Architecture	30	70	100	40
5	Analog Systems	30	70	100	40
6	Microwave And Antenna Communication	30	70	100	40
7	Project and Viva				

MSC ELECTRONICS - FIRST YEAR SYLLABUS

MATHEMATICS

Unit-I

Derivation- Derivatives and Continuity – Algebra of Derivatives – Chain Rule – One sided derivatives and Infinite derivatives – Function with non-Zero derivative – Zero derivatives and local extrema – Roll's Theorem. The Mean Value Theorem for derivatives – Intermediate Value Theorem for derivatives – Taylor's formula with remainder

Functions of Bounded Variations-Properties of Monotonic functions –Total Variation – Addition Property of total Variations – Total Variation on [a, x] as a function of x – Function of bounded variation expressed as the difference of increasing functions – continuous function of bounded variation.

Unit-II

The Riemann Stieltje's Integral-Linear properties – Integration by parts – Change of variable in a Riemann Stieltjes' integral – Reduction to a Riemann Integral –Eulers' Summation Formula – Monotonically increasing Integrators – Upper and Lower Integrals - Riemann's Condition – Comparison Theorems – Integrators of bounded variation –Mean Value Theorem for Riemann Stieltje's Integrals – The Integral as a function of interval – 2nd Fundamental Theorem of Integral Calculus – Change of variable in a Riemann Integral – Second Mean Value Theorem for Riemann Integrals.

Unit-III

Sequences of Functions-Point wise Convergence of sequences of functions – Examples of sequences real valued functions – Definition of uniform Convergence – uniform Convergence and continuity – The Cauchy condition for uniform Convergence – Uniform Convergence of Infinite Series of function – Uniform Convergence and Riemann Stieltje's Integration – The Taylor's Series generated by a function – Bernstein's Theorem – The Bionomial Series – Abel's Limit Theorem – Tauber's Theorem.

Unit-IV

Measure Theory-Inner Measure – Out Measure – Measurable Set – Measurable Function – properties of Measurable function – Little woods' three principles – The Lebesgue Integral of a bounded function over a set of finite measure – The Integral of a non-negative function – The general Lebesgue Integral.

Unit-V

Differentiation and Integration-Differentiation of monotonic function – Functions of bounded variation – Differentiation of an Integral – Absolute continuity – Infinite products – Products and Series of partial fractions for Trigonometric functions – Gamma function.

ENGLISH COMMUNICATION

UNIT-I

Communication skills-principles of communication-inflective communication-communication barriers and how to overcome Communication barriers-Development of Effective messages: knowing the audience, structuring the message, selecting proper channels, minimizing' barriers and facilitating-Feedback

UNIT-II

Concepts of Language Grammar & Usage: Principles of Language Grammar & Usage-Sentence elements: words, phrases, clauses. Phrase structure and clause structure, transformation of sentences. Constructing correct and effective sentences. Punctuation. Mechanics of writing.

UNIT-III

Writing: Preparing & Writing-Understanding the writing assignment : topic, purpose, audience, scope and constraints. Analyzing the context. Determining the scope of topic. Audience Analysis of entry behaviour. Collecting information for the assignments.

UNIT-IV

Messages: Designing a Message outline-Organizing ideas : Structural components of the text and supporting elements-determining the general and specific purpose, organizing principles, of the text-Outlining: Keyword and topic sentence outlines, writing target statements.

UNIT-V

Writing & Reviewing-Principles of presentation of text: Progressive differentiation, integrative reconciliation, sequential organization and consolidation. Procedures for writing texts with specific purposes-Reviewing

ENVIRONMENTAL ENGINEERING

UNIT – I

Environment and Resources: Renewable resources and Non-renewable resources; Forest resources; Water resources: surface and ground water, floods, droughts, conflicts over water, dams' benefits and problems; Mineral resources: environmental effects of extracting and using mineral resources; Food resources: World food problems, changes caused by agriculture and overgrazing, fertilizer-pesticide problem, water logging, salinity ;Energy resources; Land resources: land degradation; man induced landslides, soil erosion and desertification

UNIT- II

Eco System-Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological Pyramids, Introduction, types, characteristics features structure and function of the following ecosystem- Forest ecosystems, Grassland ecosystem, Desert ecosystem, Aquatic ecosystem

UNIT –III

Biodiversity and its Conservation: Genetic, species and ecosystem diversity. Biogeographically classification of India. Value of biodiversity: consumptive use, production use, social, ethical, aesthetic and option values. Biodiversity at global, national and local levels. India as a mega-diversity nation Hot –spots of biodiversity, Threats of biodiversity: habitat loses, poaching of wildlife, man – wildlife conflicts. Endangered and endemic species on India.

UNIT – IV

Environmental Pollution and Protection: Effects and control measures of Air pollution, Water pollution, Soil Pollution, Marine pollution, .Noise pollution, Thermal pollution, nuclear pollution. Solid waste Management: Causes, effects and control measures of urban and industrial water. Role of an individual in prevention of pollution, Pollution- case studies. Disaster management; floods, earthquake, cyclone and landslides. Population growth, variation among nations, Population explosion - family welfare programme, Environment and human health

UNIT – V

Social Issues of the Environment: Sustainable development, urban problems related to energy, Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people; problems and concerned, Environmental ethics: Issues and possible solutions. Climate change global warming, acid rain ozone layer depletion, nuclear accidents and holocaust Case studies. Wasteland reclamation. Consumerism and waste Products. Environment protection act. Issues involved in enforcement of environmental legislation. Public awareness.

ADVANCED CONTROL SYSTEMS

UNIT-I

Advanced Control Systems: Control System Circuits - Transfer Functions-Block diagrams-Signal flow graph-Steady state error-error coefficients-Type-1,Type-2 and Type 0 systems, Transient and Steady state response-Transient response characteristics

UNIT-II

Stability of a system-Routh's Hurwitz Criterion-General rules for constructing Routh's Hurwitz Criterion-Limitations of Routh's Hurwitz Criterion-Root Loci Method-Frequency response-Nyquist criterion

UNIT-III

Bode Diagram-Introduction to Bode plot-Applications-Advantages and Disadvantages-Transfer function Plots for typical transfer functions-Comparison of Polar, Bode, Root locus and Nicholas plots

UNIT-IV

Analysis of Nicholas chart-State variable formation-Analysis with State variables: Stability, Controllability and Observability-Time response of the state variables of a system-Examples and Applications

UNIT-V

Concepts of Proportional Integral Control-Electrical lead network-Phase lag equivalent-Compensation technique-Laplace transforms-Laplace transform theorems

IT TOOLS AND APPLICATIONS

UNIT – I

Technical Evolution of Computers, Categories of Commercial Computers, Systems Software, Application Software, Uses and Impact of Computers, Central Processing Unit, Types of Computer Memory, Number System, Input Concepts, Input Devices, Output Concepts, Output Devices, Soft Copy Devices, Storage Devices, File Organisation

UNIT – II

Disk Operating Systems and Windows - DOS Files, Organising Files, DOS Commands, Preparing Fixed Disk, Making more memory available, Control Keys Functions, Windows all versions, Starting and Quitting a Program, Organising Files and Folders, Setting up a Printer, Commonly used Commands, Network Neighborhood, Shared Folders or Printers, Optimizing Computer

UNIT – III

Microsoft Office 2000 – MS-Word – Creating, Saving, Finding & Replacing text, Copying and Moving Text, Creating hyperlinks, Auto Text, Fonts, Underline, Boldface, Animation Effects, Subscript & Superscript, Margins, Tab Stops, Line Spacing, Alignment, Indenting, Borders and Shading, Numbering and Bullets, Header & Footers, Tables, Mail Merge ;MS-Excel – Workbook, Cells, Formatting, Simple calculations, Referencing formulas, Worksheets, Copy Formulas, Graphs ;MS-PowerPoint – Introduction, Preparing Presentation, AutoContent Wizard, Formatting, Editing, Printing slides, Organisation Chart, Transitions, Animations

UNIT – IV

Database Systems – Data Modeling for a Database, Data Integration, DBMS, Entity-Relationship Model, Relational Data Model, Network Data Model, Hierarchical Model, SQL, Data base Design, Normalization, Reliability, Transactions, Database Security, Distributed Databases, Expert Systems

UNIT – V

Internet and Web Designing – The Internet, Commerce on Internet, Governance on Internet, Domain Names, Internal Access, World Wide Web, Web Browsers, Search Engines, "Surfing" the Net, Cookies, Downloading, Electronic Mail (E-Mail), Advantages of e-Mail, Different E-Mail Protocols, E-Mail Addresses, Junk e-mailers, Free Web Based Email Service: Hotmail, Spamming.

ELECTRONIC NETWORKING

UNIT-I

Electronic Networks: Network Graphs-Rank Of Graph-Tree-Incident Matrix –Kirchhoff's Current Law& Voltage Law, Matrics, Ordinary Differential Equations-Cayley-Hamilton Theorem-Laplace Transform-Convolution, Fourier Series-Trigonometric Fourier Series – Complex Form Or Exponential Fourier Series-Fourier Transform

UNIT-II

Coupled Circuits- Two-Port Network-Characterization in terms of Z,y,h and ABCD parameters- Equivalent Circuit using Z-parameters, y-parameters, h-parameters, Relations between Two-port Parameters, Interconnection of Two Ports Networks-Series connection-Parallel-connection-Cascade connection

UNIT-III

Transfer Function of Two Ports-Voltage transfer ratio-Transfer impedance-Transfer admittance-Application of Network Parameters to the Analysis of Two-port Networks-T-network-General ladder network-π-network, Lattice network-Bridges-T and parallel-T, Transfer Function of Terminated Two-port Networks,

UNIT-IV

Network Theorems-Theorems and Applications of electronic networks -Reciprocity Theorem-Proof-Thevenin's Theorem-Proof-Norton's Theorem-Proof-Superposition Theorem-proof-Maximum Power Transfer Theorem-Proof-Star delta conversion

UNIT-V

Introduction to Network Functions- Significance Of Poles And Zeros-Restriction On The Location Of Poles and Zeros in the S-plane-Time Domain Behaviour from Pole-zero Plot-Amplitude and Phase Response from Pole-zero Diagram-Two Port Network-Resonance

MTE 107 PRACTICAL-I

MTE 108 PRACTICAL-II

MSC ELECTRONICS - SECOND YEAR SYLLABUS

ADVANCED COMMUNICATION SYSTEMS

UNIT-I

Communication System, Linear (Amplitude) & Angle (FM/Phase) Modulation Systems-Angle Modulation-Generation Of AM-Grid modulated Class C Amplifier-Plate Modulated Class C Amplifier-Suppression of Carrier in SSB System-Frequency Synchronization in SSB Systems-Filter method-Phase-shift Method-Weaver's Method-Forms of AM

UNIT-II

Super Heterodyne Receivers, receiver characteristics, Pulse Code Modulation, Encoding techniques, Digital Modulation Systems, Delta modulation, Multiplexing-Frequency Division Multiplexing ,Time, Division Multiplexing Optical Communication

UNIT-III

Light Amplification by Stimulated Emission of Radiation-Types of Lasers, Photo Detectors-Types Of Photo Detectors-Photo diode materials-Parameters of a photo detector, Solar Cells-Types Of Solar Cells-Parameters Of A Solar Cell, Optical Fibre Communication-Types of Fibers-Optical Fibre Communication System-Opto-couplers

UNIT-IV

Modulation Techniques-Amplitude Modulation-Frequency Modulation-Phase Modulation-Amplitude Shift Keying(ASK)-Frequency Shift Keying (FSK)-Phase Shift Keying(PSK)-Quadrature Amplitude Modulation(QAM),

UNIT-V

Multiplexing-Frequency Division Multiplexing(FDM)-Time Division Multiplexing (TDM)-Pulse Code Modulation(PCM),Information Theory, Cellular Telephone System-FDMA(Frequency Division Multiple Accessing)-TDMA(Time Division Multiple Accessing)-CDMA(Code-Division Multiple Accessing), GSM(Global Systems for Mobile Communication)-Random Variables.

ADVANCED MICROPROCESSOR

UNIT- I

Advanced Microprocessors: Introduction to Microprocessor-Evolution of Microprocessor-Overview of Intel Pro-Pentium-Motorola 68000 Series-Introduction to DEC Alpha, Power PC-RISC & CISC Characteristics

UNIT - II

Basic Microprocessor Architecture And Interface: Internal Architecture -External System Bus Architecture-Memory and Input / Output Interface

UNIT - III

Programming Mode: Register Organization Of 8086-Memory Addressing And Instruction Formats-Memory Interfacing-Cache Memory And Cache Controllers

UNIT - IV

Basic I/O Interface: I/O Interface-8255 Programmable Interface-8254 Programmable Timer- 8251 Programmable/Communication Interface-Interrupts-8259 Programmable Interrupts Controller-Real Time Clock-DMA-8237/8257 DMA Controller

UNIT - V

8086 Assembly Language Programming: Instruction set of 8086-Assembler Directives and Operators-A Few Machine Level Programs-Machine coding and Programs-Programming with an Assembler-Assembly Language Example Programs

ELECTROMAGNETIC WAVES

UNIT-I

Vector, Line And Surface Integral Etc-Maxwell's Equations-Wave Equations-Poynting Vector-Plane Waves-Propagation Through Various Media Reflection And Refraction, Radio Wave Propagation-Ground Wave(Surface Wave) Propagation –Space Wave Propagation-Ionospheric (Sky) Wave Propagation

UNIT-II

Introduction to Transmission Lines & Rectangular Wave Guides-Hyperbolic form of transmission line equations-Differential form of transmission line equations-Rectangular Wave Guides-Guide wavelength

UNIT-III

Antennas-Radiation resistance, Dipole Antenna-Loop Antenna-Antenna Arrays-arrays of 2 isotropic point sources, Formulae for Long Linear Arrays-Hansen and Wood yard condition, Yagi Uda Antenna-Slot Antenna-

UNIT-IV

Horn Antenna-E-Plane Sectorial antenna, H-Plane sectorial antenna, Pyramidal horn antenna, Parabolic Reflector Antennas-Yagi Antenna-Elements, Yagi Antenna-Rhombic Antenna-Slot Antenna-Helical Antenna,

UNIT-V

Smith Chart, Constant Reactance Circle, Properties, S-Matrix, Range And Properties, Optical Fibre Communication –Advantages And Disadvantages of optical fibre communication, Total Internal Reflection

COMPUTER ARCHITECTURE

Unit - I

Computers-Architecture- First Generation Computers Second Generation Computers -Third Generation Computers-Fourth Generation Computers -Fifth Generation Computers-Later Generations-Classification Of Computers-Micro Computer-Mini Computer-Mainframe Computer-Super Computer-Register Transfer and Micro operations-Register transfer-Bus and Memory Transfers-tree-state bus buffers-Memory transfer-Micro-Operations -Register transfer Micro-Operations-Arithmetic Micro-Operations-Logic Micro-Operations-Shift Micro-Operations

Unit - II

Programming elements-Computer Arithmetic-Addition and subtraction with signed-magnitude-Multiplication –algorithm-Booth multiplication algorithm-Array multiplier-Division algorithm-Hardware algorithm- Divide Overflow-Floating-point Arithmetic operations-Basic considerations-Register configuration-Addition and subtraction- Decimal Arithmetic operations-BCD adder-BCD subtraction-Programming the Basic Computer-Machine language-Assembly language-Assembler-First pass-Second pass-Programming Arithmetic and Logic operations-Multiplication Program-Double-Precision Addition-Logic operations-Shift operations

Unit - III

Central Progressing Unit (CPU)-Stack organization-Register stack-Memory stack-Reverse polish notation-Instruction Formats-Three- address Instructions-Two – address instructions-One- address instructions-Zero-address instructions-RISC Instructions-Addressing Modes-Reduced Instruction Set Computer-CISC characteristics-RISC characteristics-Input-Output Organization-Modes of transfer-Programmed I/O-Interrupt-Initiated I/O- Priority interrupt-Daisy-chaining priority-Parallel priority interrupt-Interrupt cycle- DMA-DMA Controller-DMA Transfer- Input-Output Processor (IOP)-CPU-IOP Communication-Serial Communication-Character-Oriented Protocol-Bit-Oriented Protocol-Modes of transfer

Unit- IV

Memory Organization-Memory hierarchy-Main memory-RAM and ROM chips -Memory Address Map-Auxiliary memory-Magnetic disks-Magnetic Tape-Cache memory-Direct Mapping-Associative Mapping-Set- associative Mapping-Virtual memory-Associative memory Page table-Page Replacement-Introduction to Parallel Processing-Pipelining -Parallel processing-Pipelining general consideration-Arithmetic pipeline-Instruction pipeline

Unit - V

Vector Processing-Vector operations-Matrix multiplication-Memory interleaving-multiprocessor-characteristics of multiprocessors-interconnection structure-Time-shared common-bus-multi-port memory-crossbar switch-multistage switching network-hypercube interconnection-Inter processor arbitration-Cache coherence-instruction execution.

ANALOG SYSTEMS

UNIT-I

Transistors Biasing-FET'S- Amplifier Circuits-Direct coupled Amplifier-RC Coupled Amplifier-Transformer Coupled Amplifier-CE,CB ,CC configuration-Hybrid Model-Small Signal (AC MODEL) of BJT-CE,CB & CC Amplifier-BJT amplifier-Hybrid π or Giacoleto Model

UNIT-II

Working of FET Amplifier-Multi Stage Amplifiers-Compound transistor stages-Darlington Connection Feedback Amplifiers-Types Of Feedback Amplifier-Effect on 3 dB frequencies/bandwidth-Feedback Topologies-Differential amplifiers-AC operation of circuit

UNIT-III

Principles of Operational Amplifier-Characteristics-Op-amp Parameters-Electronic Analog Computation-Op-amp filters-Band-pass filter-All pass filter-Linear Applications of an OP-AMP-Op-amp as Astable Multivibrator

UNIT-IV

Non-Linear Applications Of OA-AMP, Broad Band Amplifier-Wideband transistor configurations, Tuned Amplifier, Power Amplifiers-Various Amplifiers Classes-Class B Amplifiers-Class AB Amplifiers-Class C Amplifiers

UNIT-V

Types of oscillators: Oscillatiors-RC Oscillators- LC Oscillators- Crystal Oscillators-Relaxation Oscillators, Function Generators And Wave Shaping Circuits- Function Generators-Triangular-Saw tooth-Wave Shaping Circuits-Triangular to wave shape-monolithic waveform generators Power Supplies-Unregulated Power Supply-Zener Regulators-Open-Loop & Closed–loop Series Regulators-Current /Voltage Limited Power Supplies-Crow Bar Protection-High Current Capability-Line Transients Protection-Switched Mode Power Supplies-OP-AMP.

MICROWAVE AND ANTENNA COMMUNICATION

UNIT-I

Microwave devices and circuits-Ratings-Power gain ,efficiency, Power Output, Multi cavity Klystron Amplifier-Reflex Klystron-Travelling Wave Tubes (TWT)-Characteristics of Travelling wave tubes-Magnetron Oscillators-classification of Magnetron Oscillators – Applications of Magnetron Oscillators –Ratings-Crossed-field Amplifier(CFA)-Backward-wave Oscillators(BWO)-Characteristics, Applications and ratings

UNIT-II

Varactor and step-recovery Diodes-characteristics and applications-Tunnel Diode-Gunn Diodes-Impatt Diodes-Trapatt Diodes-Other Microwave Diodes-Maser Amplifier-working principle-Applications-LASER-Working principle & Characteristics of LASER-Parametric Amplifiers-Microwave Hybrid Circuits-Hybrid rings-Directional coupler-circulators and isolators-Micro strip Lines-Modes on mono strip lines

UNIT-III

Monolithic Microwave Integrated Circuits(MMICs)-Working principle-Advantages and disadvantages-Surface Acoustic Wave Oscillators –Range and applications-Antenna Action, Short Electric Doublet- Radiation Resistance, Radiation From A Current Element, Thin Linear Antenna(Approximate Analysis)-Total Power Radiated-Radiation Resistance, Thin Linear Antenna In Space-Calculation Of Radiation Fields-Fields Patterns For Particular Cases-Calculation Of Power Radiated And Radiation Resistance

UNIT-IV

Current Distribution On Resonant And Non-Resonant Antennas, Grounded Antennas- Short Vertical Grounded Antenna-Field Distribution-Field Pattern; Distribution Of Radiated Energy In Vertical Plane-Marconi Aerial, Field Strength At A Point Close To The Antenna Within The Range Of Direct Ray-Directive Gain, Linear Arrays Of N Isotropic Point Sources Of Equal Amplitude And Spacing, Continuous Arrays, Multiplication Of Patterns, Array Of Two Driven Λ/2 Elements-Broad Side Case-End Fire Case

UNIT-V

Yagi Antenna Or Parasitically Excited End Fire Arrays, Loop Antenna, Parabolic Reflectors, Field Distribution Across The Aperture Of Parabolic Reflector, Rectangular Horns, Optimum Horn Dimensions-Self And Mutual Impedances Of Antennas-Self-Impedance Of A Thin Linear Antenna-Mutual Impedance, Antenna Measurements, Broad-Band Antenna Principles, Practical Transmitting Antennas, Receiving Antennas, Difference In Receiving Transmitting Antennas

MTE 207 Project and Viva