UNIVERSITY OF MUMBAI
SCHEME OF INSTRUCTION AND EVALUATION (R2007)
Programme: B.E. Electronics and Telecommunication Engineering,

Scheme for Semester VIII

Sr. No	Subjects	No. of Periods per week (60 minutes each)			Duration of Theory papers (Hours)	Marks			
		Lecture	Practi-cal	Tuto-rial		Theory	Term-work	Oral	Total
1.	**Advance Microwave Engineering**	4	2	-	3	100	25	25	**150**
2.	**Optical Fibre Communication**	4	2	-	3	100	25	25	**150**
3	**Wireless Network**	4	2	-	3	100	25	25	**150**
4.	**Project stage-II**	-	-	8	-	-	50	100	**150**
5.	**Elective-VIII Sem**	4	2	-	3	100	25	25	**150**
Total….		**16**	**8**	**8**	**-**	**400**	**150**	**200**	**750**

SCHEME FOR OFFERING ELECTIVE TO STUDENTS (Any ONE): BE, VIII Semester

SEM VIII:	SEM VIII:	SEM VIII:	SEM VIII:
1. IMAGE PROCESSING	**2. SATELLITE COMMUNICATION**	**3. TELECOM NETWORK MANAGEMENT**	**4. MICROWAVE INTEGRATED CIRCUITS**

University of Mumbai			
CLASS: B.E. (Electronics & Telecommunication Engineering)		**Semester - VIII**	
SUBJECT: Advanced Microwave Engineering			
Periods per week (Each of 60 min.)	Lecture	4	
	Practical	2	
	Tutorial	-	
		Hours	Marks
Evaluation System	Theory Examination	3	100
	Practical examination	-	-
	Oral Examination	-	25
	Term Work	-	25
	Total		**150**

Module	Contents	Hours
Objective	**This course will help students understand the basic principles and advanced applications of Microwave Engineering, as well as different amplifier design, oscillators design, and mixers.**	-
1	**TWO-PORT NETWORKS** Two-Port Parameters. S-Parameters. S-Parameters from Spice Analysis. Stability. Power Gains, Voltage Gains and Current Gains. Three Ports. Derivation of Transducer Power Gain. Differential S-Parameters. Twisted-Wire Pair Lines. Low-Noise and High-Power Amplifier Design.	**6hrs**
2	**NOISE IN LINEAR TWO-PORT** Signal-to-Noise Ratio. Noise Figure Measurements. Noise Parameters and Noise Correlation Matrix. Noise Two-Port Description. Noise Figure of Cascaded Networks. Influence of External Parasitic Elements. Noise Circuits. Noise Correlation in Linear Two-Ports using Correlation Matrices. Noise Figure Test Equipment. Determination of Noise Parameters. Calculation of Noise Properties of Bipolar and FETs. Bipolar Transistor Noise Model in T Configuration. The GaAs FET Noise Model.	**8hrs**
3	**SMALL- AND LARGE-SIGNAL AMPLIFIER DESIGN** Introduction. Single-Stage Amplifier Design—High Gain, Maximum Available Gain and	**8hrs**

	Unilateral Gain, Low-Noise, High-Power, Broadband, Feedback, Cascode, Multistage, Distributed and Matrix, Multimeter-Wave Amplifiers. Frequency Multipliers. Design Examples of 1.9-GHz PCS and 2.1-GHz W-CDMA Amplifiers. Stability Analysis and Limitations.	
4	**POWER AMPLIFIER DESIGN** Introduction. Device Modeling and Characteristics. Optimum Loading. Single-Stage Power Amplifier Design. Multistage Design. Power Distributed Amplifiers. Class of Operation. Power Amplifier Stability. Amplifier Linearization Methods.	**8hrs**
5	**OSCILLATOR DESIGN** Introduction. Compressed Smith Chart. Series of Parallel Resonance. Resonators. Two-Port Oscillator Design. Negative Resistance from Transistor Model. Oscillator Q and Output Power. Noise in Oscillators: Linear Approach. Analytic Approach to Optimum Oscillator Design using S Parameters. Nonlinear Active Models for Oscillators. Oscillator Design using Nonlinear CAD Tools. Microwave Oscillator Performance. Design of an Oscillator using Large Single Y Parameters. Example for Large Single Design Based on Bessel Functions. Design Examples for Best Phase Noise and Good Output Power. CAD Solution for Calculating Phase Noise in Oscillators. Validation Circuits. Analytical Approach for Designing Efficient Microwave FET and Bipolar Oscillators.	**10hrs**
6	**MICROWAVE MIXER DESIGN** Introduction. Diode Mixer Theory. Single-Diode, Single-Balanced, and Double-Balanced Mixers. FET Mixer Theory. Balanced FET Mixers. Special Mixer Circuits. Using Modern CAD Tools. Mixer Noise. Diode mixer theory, single diode mixer, balanced mixer, FET mixer theory, balanced FET mixer	**6hrs**

Theory Examination:

1. Question paper will comprise of total 7 questions, each of 20 marks.
2. Only 5 questions need to be solved.
3. Questions will be analytical and design oriented.
4. Question number 1 will be compulsory and cover all modules.

5. Remaining questions will be mixed in nature. (e.g. - Suppose Q.2 has part (a) from, module 3 then part (b) will be from any module other than module 3.)
6. In the question paper, weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Oral Examination:

Oral examination will be conducted to test the overall understanding of the subject based on the syllabus .

Term work:

Term work shall consist of minimum four experiments & four tutorials and a written test.

The distribution of marks for term work shall be as follows,

Laboratory work (Experiments and Journal) : 15 marks.

Test (at least one) : 10 marks.

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

Recommended Books:

1. Microwave Circuit Design - George D. Vendelin, Anthony M. Pavio & Ulrich L. Rehde John Wiley & Sons publication
2. Radio Frequency and Microwave Electronics - Matthew M. Radmanesh Pearson Education Asia publication

University of Mumbai			
CLASS: B.E. (Electronics & Telecommunication Engineering)		**Semester - VIII**	
SUBJECT: Optical Fibre Communication			
Periods per week (Each of 60 min.)	Lecture	4	
	Practical	2	
	Tutorial	-	
		Hours	Marks
Evaluation System	Theory Examination	3	100
	Practical examination	-	-
	Oral Examination	-	25
	Term Work	-	25
	Total		**150**

Module	Contents	Hours
Objective	**To understand the concept of transmission through Optical Fibre.**	-
1	**Overview Of Optical Fiber Communications:** Communication system applications in the electromagnetic spectrum, elements of or fiber transmission link, advantages of optical fiber communication. **Light Propagation in Optical Fiber:** Filter types, rays and modes, ray theory transmission, electromagnetic mode theory propagation, single mode and multimode fibers, linearly polarized models.	**8hrs**
2	**Fiber Optics Technology:** Fiber materials, fiber fabrication, fiber optic cables, couplers, splices, connectors.	**8hrs**
3	**Signal Degradation in Optical Fibers:** Alternation, dispersion, bit rate and bandwidths, mode coupling.	**8hrs**
4	**Optical Sources and Detectors:** Related semiconductor physics, light emitting diodes, laser diodes, their characteristics modulation circuits, optical detection principles, quantum efficiency, responsively, n time photo detector noise, PIN and Avalanche photodiodes.	**8hrs**

5	**Optical Receiver Operation:** Noise, Receiver capacitance, receiver structures, pre-amplifiers.	**8hrs**
6	**Optical Fiber Systems:** Link power budget, rise time budget, analog systems, digital systems, coherent systems- homodyne and heterodyne detection, multiplexing. **Optical Fiber Measurements:** Measurement of attenuation, dispersion, refractive index profile, numerical aperture diameter, OTDR.	**8hrs**

Theory Examination:

1. Question paper will comprise of total 7 questions, each of 20 marks.
2. Only 5 questions need to be solved.
3. Questions will be analytical and design oriented.
4. Question number 1 will be compulsory and cover all modules.
5. Remaining questions will be mixed in nature. (e.g. - Suppose Q.2 has part (a) from, module 3 then part (b) will be from any module other than module 3.)
6. In the question paper, weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Oral Examination:

Oral examination will be conducted to test the overall understanding of the subject based on the syllabus .

Term work:

Term work shall consist of minimum six experiments and a written test.
The distribution of marks for term work shall be as follows,
Laboratory work (Experiments and Journal) : 15 marks.
Test (at least one) : 10 marks.
The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

Practical list

1. Analog fiber optic system
2. Digital fiber optic system
3. Measurement of numerical aperture
4. Measurement of attenuation
5. Measurement of pulse spreading

6. Multiplexing in fiber optic system
7. Light source characteristics
8. Measurements using OTDR

Recommended Books:
Text Books:
1. Optical Fiber Communication - John Senior Prentice Hall of India Publication.
2. Optical Fiber Communication - Gred Keiser Mc- Graw Hill Publication

Reference Books:
1. Fiber Optic Communication - Djafar K. Mynbarv, Lowell L. Scheiner
2. Optical Fiber Communication - Selvarajan, Subartkar, T. Srinivas Tata Mc-Graw Hill Publication
3. Fundamentals of Fibre Optics in Telecommunication and sensor System, Pal B.P., New Age International
4. Fiber Optic Communication, Agrawal, 3rd edi, Wiley
5. Fibre optics and Optoelectronics by Khare,Oxford University Press
6. Rajappa Papannareddy, Lightwave Communication Systems: A Practical Perspective, Penram International Publishing

University of Mumbai			
CLASS: B.E. (Electronics & Telecommunication Engineering)		**Semester - VIII**	
SUBJECT: WIRELESS NETWORK			
Periods per week (Each of 60 min.)	Lecture	4	
	Practical	2	
	Tutorial	-	
		Hours	Marks
Evaluation System	Theory Examination	3	100
	Practical examination	-	-
	Oral Examination	-	25
	Term Work	-	25
	Total		**150**

Module	Contents	Hours
Objective	**To understand the concept of wireless WAN, WAP and different IEEE standards.**	-
1	**Wide Area Wireless Networks (WANs) – GSM Evolution** Introduction, GSM evolution for data, Third-Generation (3G) Wireless Systems UMTS Network Reference Architecture, Channel Structure in UMTS Terrestrial Radio Access Network, UMTS Terrestrial Radio Access Network Overview ,UMTS Core Network Architecture, Adaptive Multi-Rate Codec for UMTS, UMTS Bearer Service,HSDPA.	**8hrs**
2	**Wide Area Wireless Networks (WANs) – CDMA One Evolution** Introduction, cdma2000 Layering Structure, Forward Link Physical Channels of cdma2000 ,Forward Link Features, Reverse Link Physical Channels of cdma2000 Evolution of cdmaOne (IS-95) to cdma2000,Technical Differences between cdma2000 and WCDMA.	**8hrs**
3	**Planning and Design of Wide Area Wireless Networks** Introduction , Planning and Design of a Wireless Network, Radio Design for a Cellular Network, Receiver Sensitivity and Link Budget .	**8hrs**

4	**Wireless Application Protocol (WAP)** Introduction, WAP and the World Wide Web (WWW) , Introduction to Wireless Application Protocol , The WAP Programming Model ,WAP Architecture , WAP Advantages and Disadvantages , Applications of WAP, imode, imode versus WAP.	**8hrs**
5	**Wireless Personal Area Network – Bluetooth** Introduction, The Wireless Personal Area Network , Bluetooth (IEEE 802.15.1), Definitions of the Terms Used in Bluetooth, Bluetooth Protocol Stack, Bluetooth Link Types, Bluetooth Security, Network Connection Establishment in Bluetooth, Network Topology in Bluetooth, Bluetooth Usage Models, Bluetooth Applications, WAP and Bluetooth **Wireless Personal Area Networks (WPAN): Low Rate (LR) and High Rate (HR)** Wireless Sensor Network, Usage of Wireless Sensor Networks, Wireless Sensor Network Model, Sensor Network Protocol Stack, ZigBee Technology, IEEE 802.15.4 LR-WPAN Device Architecture, IEEE 802.15.3a — Ultra WideBand, Radio Frequency Identification.	**10hrs**
6	**Wireless Local Area Networks (WLANs)** WLAN Equipment , WLAN Topologies, WLAN Technologies, IEEE 802.11 WLAN Joining an Existing Basic Service Set, IEEE 802.11n , IEEE 802.16 ,World Interoperability for MicroAccess, Inc. (WiMAX).	**6hrs**

Theory Examination:

1. Question paper will comprise of total 7 questions, each of 20 marks.
2. Only 5 questions need to be solved.
3. Questions will be analytical and design oriented.
4. Question number 1 will be compulsory and cover all modules.
5. Remaining questions will be mixed in nature. (e.g. - Suppose Q.2 has part (a) from, module 3 then part (b) will be from any module other than module 3.)
6. In the question paper, weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Oral Examination:

Oral examination will be conducted to test the overall understanding of the subject based on the syllabus .

Term work:

Term work shall consist of minimum Six experiments & tutorials and a written test.

The distribution of marks for term work shall be as follows,

Laboratory work (Experiments and Journal) : 15 marks.

Test (at least one) : 10 marks.

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

Recommended Books:

Text:

1. Wireless communication and Networking-Vijay Garg, ELSEVIER Inc.
2. Wireless Communication_Singal_TMH

Reference Books

1. Next Generation Wireless Systems and Networks: Hsiao – Hwa Chen, Mohsen Guizani – Wiley
2. Wireless and Mobile Networks-Concepts and protocols: Dr Sunilkumar S. Manvi, Mahabaleshwar S. Kakkasageri-- Wiley
3. Essentials of UMTS: Christopher Cox—Cambridge

www.campuskeeda.com

B. E. Electronics and Telecommunication Engineering
Fourth Year Semester VIII

Subject – Project -II

Project Hour: 8 Hrs/week	Term work: **50 marks** Oral / Practical/ Presentation / Demonstration examination: **100 marks** Total marks= **150 marks**

Note: One faculty will not guide more than 3 projects in a semester. For every group allotted to faculty the load is considered as 2 Hour per group (Internal/ External Project) per week, be specified in the time table of faculty.

Rationale: Project allows the student to work independently to put the knowledge of **Electronics and Telecommunication engineering** theory into practice.

Detailed description

In continuation to the efforts taken towards building the project in VII semester, during VIII semester, students are expected to complete their project idea and meet the set goals and compile the project report.

FINAL PROJECT REPORT

Your guide will give you specific instructions as to the expected content of your final report. The report should cover the progress that has been made, including results obtained, graphical data, design drawings, and a statement of conclusions and recommendations (if applicable). Details of theory, experimental data, computer programs, purchased materials, sources and suppliers etc., must be included. Your report must be sufficiently complete that a student continuing your project would benefit from your report and would not be required to duplicate any of your work.

PROJECT MARKING SCHEME

A project used to assign marks in three general categories, as explained below. Achievement in each of these areas is critical to a successful project.

Project Goals & Achievements (20%): Guide will evaluate both the difficulty of the goals and whether the goals were achieved. Although projects will differ, it is always extremely important to set goals at the start of a project and work toward these goals. The project goals should be set in collaboration with the guide and an effort should be made to establish a realistic scope for the project. In some cases, it may become apparent as the project progresses that the original goals need to be adjusted and a modified set of goals must be set.

Final Report Quality & Content (40%): This is an evaluation of the quality of the final report based on the report format, the clarity of communication and the analytical content.

Student Organization, Creativity & Effort (40%): This portion of the evaluation reflects the student's performance, with emphasis on effort, organization, creativity and initiative.

Project Report Outline

The hard-bound report will contain following details:

- Title
- Certificate
- Acknowledgement (if any)
- Table of Contents
- List of Figures
- Abstract
- Introduction
- Literature Survey
- Mathematical Modeling/ Analysis and Design
- Implementation
- Result and Discussion
- Conclusion and Future Scope
- Reference
- Appendix (optional)

Term work

Term work shall consist of the above mentioned activities which shall be evaluated and shall carry a weight-age of 50 marks.

Oral Examination

The oral examination shall be conducted on the basis of presentation/ practical / demonstration given by the students and shall carry a weightage of 100 marks.

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University of Mumbai			
CLASS: B.E. (Electronics & Telecommunication Engineering)		**Semester – VIII Elective**	
SUBJECT: Digital Image Processing			
Periods per week (Each of 60 min.)	Lecture	4	
	Practical	2	
	Tutorial	-	
		Hours	Marks
Evaluation System	Theory Examination	3	100
	Practical examination	-	-
	Oral Examination	-	25
	Term Work	-	25
	Total		**150**

Module	Contents	Hours
Objective	**The objectives of this course are to:** **- Cover the basic theory and algorithms that are widely used in digital image processing** **- Expose students to current technologies and issues that are specific to image processing systems** **- Develop hands-on experience in using computers to process images.**	-
1	**Digital Image fundamentals** Digital Image Representation, Elements of digital Image processing systems, Elements of Visual Perception, Sampling and Quantization, Basic relationships between pixels.	**4 hrs**
2	**Image Transforms** 2D DFT and its properties, Walsh Transform, Hadamard Transform, Haar Transform, Discrete Cosine Transform, Slant Transform, Hotelling Transform.	**10 hrs**
3	**Image Enhancement** Spatial Domain Methods, Point Processing, Neighbourhood Processing, spatial domain filtering,	**10 hrs**

	Zooming, Enhancement based on Histogram modeling, Enhancement in Frequency domain, Frequency domain filters, Generation of spatial mask from frequency domain.	
4	**Image Compression** Fundamentals, Image compression model, Redundancy, Error Criteria, Information Theory for Image compression, Lossy and lossless compression techniques, Image compression standards.	**10 hrs**
5	**Image Segmentation** Image segmentation based on discontinuities(Point, Line & Edge detection), Edge Linking, Thresholding (Global, Local, Optimum), Region based Segmentation	**4 hrs**
6	**Image Restoration** Model of Image degradation and Restoration Process, Noise models, Spatial Filtering, Frequency Domain Filtering, Modeling the degradation function, Inverse Filtering, Wiener Filtering	**10 hrs**

Theory Examination:

1. Question paper will comprise of total 7 questions, each of 20 marks.
2. Only 5 questions need to be solved.
3. Questions will be analytical and design oriented.
4. Question number 1 will be compulsory and cover all modules.
5. Remaining questions will be mixed in nature. (e.g. - Suppose Q.2 has part (a) from, module 3 then part (b) will be from any module other than module 3.)
6. In the question paper, weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Oral Examination:

Oral examination will be conducted to test the overall understanding of the subject based on the syllabus .

Term work:

Term work shall consist of minimum eight experiments from the suggested List such that all the modules are covered & 2 tutorials and a written test.
The distribution of marks for term work shall be as follows,
Laboratory work (Experiments) : 15 marks.

Test (at least one) : 10 marks.
The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

Practical list

1. Spatial and Tonal Resolution
2. Image Rotation, Scaling, Translation
3. Forward and Inverse Transform. Comparing Inverse Transform with Image data.
4. Histogram Equalization
5. Spatial Domain filtering (High Pass, Lowpass, High Boost)
6. Frequency Domain Filtering (Butterworth filter)
7. Homomorphic Filtering
8. Compression codes
9. Image Thresholding
10. Impulse Noise removal
11. Gaussian Noise removal

Recommended Books:

Text

1. Digital Image Processing- By R. Gonzales, R. Woods- Pearson Education
2. Fundamentals of Image Processing- By Anil K. Jain, Prentice Hall of India Publication

Reference

1. Image Processing Analysis and Machine vision- Milan Sonka, Viciav Hivac, Roger Boyle- Thomson Learning Publication
2. Digital Image Processing, Pratt, 3rd edi, Wiley India

University of Mumbai			
CLASS: B.E. (Electronics & Telecommunication Engineering)		**Semester – VIII Elective**	
SUBJECT: Satellite Communications			
Periods per week (Each of 60 min.)	Lecture	4	
	Practical	2	
	Tutorial	-	
		Hours	Marks
Evaluation System	Theory Examination	3	100
	Practical examination	-	-
	Oral Examination	-	25
	Term Work	-	25
	Total		**150**

Module	Contents	Hours
Objective	**To understand the concept of satellite launching and its operations.**	-
1	**Introduction:** General background, frequency allocations for satellite services, basic satellite system, system design considerations, applications. **Satellite Orbits:** Introduction, laws governing satellite motion, antenna look angles, antenna mount, limits of visibility, Earth eclipse of satellite, inclined orbits, sun-synchronous orbit, launching of geostationary satellites.	**8hrs**
2	**Wave Propagation and Polarization:** Introduction, atmospheric losses, ionospheric effects, rain attenuation, other impairments, antenna polarization, polarization of satellite signals, cross polarization discrimination, ionospheric depolarization, rain depolarization, ice depolarization.	**6hrs**
3	**Communication Satellites:** Introduction, design considerations, lifetime and	**10hrs**

	reliability, spacecraft sub systems, spacecraft mass and power estimations, space segment cost estimates. **Satellite Antenna:** Antenna basics, aperture antennas, parabolic reflectors, offset feed, double relflector antenna shaped reflector systems.	
4	**Link Design:** Introduction, transmission losses, link power budget equation, system noise, carrier to noise ratio for uplink and downlink, combined uplink and downlink carrier to noise ratio, intermodulation noise.	**8hrs**
5	**Earth Stations:** Introduction, design considerations, general configuration and characteristics.	**6hrs**
6	**Multiple Access Techniques:** Introduction, FDMA, TDMA, FDMA/DMA, operation in a multiple beam environment, CDMA, multiple access examples	**8hrs**

Theory Examination:

1. Question paper will comprise of total 7 questions, each of 20 marks.
2. Only 5 questions need to be solved.
3. Questions will be analytical.
4. Question number 1 will be compulsory and cover all modules.
5. Remaining questions will be mixed in nature. (e.g. - Suppose Q.2 has part (a) from, module 3 then part (b) will be from any module other than module 3.)
6. In the question paper, weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Oral Examination:

Oral examination will be conducted to test the overall understanding of the subject based on the syllabus .

Term work:

Term work shall consist of minimum six experiments & 3 tutorials and a written test.

The distribution of marks for term work shall be as follows,

Laboratory work (Experiments and Journal) : 15 marks.

Test (at least one) : 10 marks.
The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

Recommended Books:
Text Books:

1. Satellite Communication, A.K.Maini; Varsha Agrawal, Wiley India
2. Satellite Communications - Dennis Roddy - 3rd edition, Mc-Graw Hill publicatio

Reference

1. Satellite Communications systems - M. Richharia - 2nd edition Mc Millan publication.
2. Satellite Communication, Pratt T, John Wiley

University of Mumbai			
CLASS: B.E. (Electronics & Telecommunication Engineering)		**Semester – VIII Elective**	
SUBJECT: Telecommunication Network Management			
Periods per week (Each of 60 min.)	Lecture	4	
	Practical	2	
	Tutorial	-	
		Hours	Marks
Evaluation System	Theory Examination	3	100
	Practical examination	-	-
	Oral Examination	-	25
	Term Work	-	25
	Total		**150**

Module	Contents	Hours
Objective	**To understand the concept of Telecom network management, architecture and protocol.**	-
1	**Foundations:** Network management standards, network management model, organization model, information model abstract syntax notation 1 (ASN.1), encoding structure, macros, functional model. **Network management application functional requirements:** Configuration management, fault management, performance management, Error correlation technology, security management, accounting management, common management, report management, polity based management, service level management, management service, community definitions, capturing the requirements, simple and formal approaches, semi formal and formal notations.	**8hrs**
2	**Telecommunication management network (TMN) architecture:** Terminology, functional architecture, information architecture, physical architecture, TNN cube, TMN and OSI .	**8hrs**

3	**Common management information service element (CMISE):** CMISE model, service definitions, errors, scooping and filtering features, synchronization, functional units, association services, common management information protocol (CMIP) specification.	**8hrs**
4	**Information Modeling for TMN:** Rationale for information modeling, management information model, object oriented modeling paradigm, structure of management information, managed object class definition, management information base (MIB)	**8hrs**
5	**Simple network management protocol (SNMP):** SNMPv1: managed networks, SNMP models, organization model, information model, SNMPv2 communication model, functional model, major changes in SNMPv2, structure of management information (SMI), MIB, SNMPv2 protocol, compatibility with SNMPv1, SNMPv3, architecture, applications, MIB security, remote monitoring (RMON) SMI and MIB, RMQN1 and RMON2.	**8hrs**
6	**Network management examples:** ATM integrated local management interface, ATM MIB. M1, M2,M3, M4, interfaces, ATM digital exchange interface management, digita1 subscriber loop (DSL) and asymmetric DSL (ADSL) technologies, ADSL configuration management, performance management **Network management tools:** Network statistics management, network management system, management platform case studies: OPENVIEW, ALMAP.	**8hrs**

Theory Examination:

1. Question paper will comprise of total 7 questions, each of 20 marks.
2. Only 5 questions need to be solved.
3. Question number 1 will be compulsory and cover all modules.
4. Remaining questions will be mixed in nature. (e.g. - Suppose Q.2 has part (a) from, module 3 then part (b) will be from any module other than module 3.)
5. In the question paper, weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Oral Examination:

Oral examination will be conducted to test the overall understanding of the subject based on the syllabus .

Term work:

Term work shall consist of minimum six experiments & tutorials and a written test.

The distribution of marks for term work shall be as follows,

Laboratory work (Experiments and Journal) : 15 marks.

Test (at least one) : 10 marks.

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

Recommended Books:

Text Books:

1. Network Management: Principles and Practice - Mani Subramanian, Addison Wesley, Pearson Education Asia publication.

2. Fundamentals of Telecommunication Network Management - Lakshmi Raman IEEE Communication Society, Prentice Hall of India Edition 1999

3.Telecommunication Network Management: Technologies and Implementations - Airdarous Salah, Plevyak Thomas. Prentice Hall of India

Reference Books:

1. Telecommunication Network Management - Haojin Wang
Mc- Graw Hill Professional Publication

University of Mumbai			
CLASS: B.E. (Electronics & Telecommunication Engineering)		**Semester – VIII Elective**	
SUBJECT: Microwave Integrated Circuits			
Periods per week (Each of 60 min.)	Lecture	4	
	Practical	2	
	Tutorial	-	
		Hours	Marks
Evaluation System	Theory Examination	3	100
	Practical examination	-	-
	Oral Examination	-	25
	Term Work	-	25
	Total		**150**

Module	Contents	Hours
Objective	**To understand the integration of microwave devices in the form of IC.**	-
1	**Hybrid MICs :** Definition, characteristics, comparison with conventional circuits, fields of application and limitations and criteria for the choice of substrate material; thin film hybrid circuits, thick film hybrid circuits, artwork, mask making, photolithography, resistor stabilization, sawing, brazing process, wire bonding.	**9hrs**
2	**Monolithic MICs:** Definition, substrate structure, doping by ion implantation ohmic contact, metal resistive layers, gate metal, dielectric second level metal, dielectric and air bridge vias, substrate vias, final wafer process steps.	**9hrs**
3	**Micro strip Lines:** Planar wave guides, non- TEM propagation, line impedance definitions, quasi-static approximations, quasi-static line parameters, micro strip open circuits and gaps, micro strip corners, step changes in width,	**9hrs**

	dispersion analysis, micro strip characteristic impedance, symmetric T junction, full wave analysis of micro strip propagation, LSE and LSM potentials, spectral domain analysis, dispersion relation for open micro strip, spectral domain impedance analysis, dispersion relation for open micro strip, spectral domain impedance analysis, Green's functions, millimeter wave modeling of micro strip lines.	
4	**Coupled Line Propagation:** Wave equations for coupled lines, propagation models, coupled line parameters, coupled line parameter variations with frequency, directional couplings, Lange coupler coupled line pair treated as a four port, coupled line pair operated as a two port assuming Oe = 0o, low pass filtel design assuming Oe =0o, coupled line pair analysed to a two port Oe not equal to 0o, narrow band filter using coupled resonator, narrow band coupled line filters, suspended substrate strip lined filters, suspended substrate strip line filter design using method 1 and method 2.	**9hrs**
5	**Slot Lines:** Analysis, design consideration, transitions and applications. **Coplanar Waveguide:** Analysis, design considerations and coplanar line circuits. **Devices:** GaAs FET, HEMT, gunn diode, varactor diodes, PIN diodes YIC resonators, dielectric resonators & their application in oscillator mixer and amplifiers.	**9hrs**

Theory Examination:

1. Question paper will comprise of total 7 questions, each of 20 marks.
2. Only 5 questions need to be solved.
3. Questions will be analytical .
4. Question number 1 will be compulsory and cover all modules.

5. Remaining questions will be mixed in nature. (e.g. - Suppose Q.2 has part (a) from, module 3 then part (b) will be from any module other than module 3.)
6. In the question paper, weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Oral Examination:

Oral examination will be conducted to test the overall understanding of the subject based on the syllabus .

Term work:

Term work shall consist of minimum six tutorials and a written test.
The distribution of marks for term work shall be as follows,
Laboratory work (Experiments and Journal) : 15 marks.
Test (at least one) : 10 marks.
The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

Recommended Books:

Text Books:

1. Microstrip Circuit Analysis - David H. Schrader, Prentice Hall PTR, New Jersey

2. Microstrip lines and Slot lines- KC. Gupta, R. Gargand I.J. Bahl , Artech House.

3. MIIC Design: GaAs FETs and HEMTs- Peter Ladbrooke ,Artech House.

4. Foundations for Microstr!p Circuit Design -T.C. Edwards,John Wiley and Sons

Reference Books:

1. MIC and MMIC Amplifier and Oscillator Circuit Design- Allen Sweet, Artech House.

2. Handbook of Microwave Integrated Circuits- Reinmut K Hoffman, Artech House.

B.E. Electronics & Telecommunication Engineering	
VIII-Eighth Semester (R2001) - Old	**Equivalent VIII-Eighth Semester (R2007)- Revised**
1. Satellite Communication	SATELLITE COMMUNICATION
2. Optical Fiber Communication	Optical Fibre Communication
3. Computer Communication Networks	Computer Communication Network(VII –R2007)
4. Elective – II	
Wireless Networks	Wireless Network
Digital Voice Communication	Digital Telephony (TE, VI sem R-2007)
Telecommunication Network Management	TELECOM NETWORK MANAGEMENT
Microwave Amplifier and Oscillator Design	Advance Microwave Engineering
Optical Networks	No Equivalent*
Internet Communication Engineering	No Equivalent*

* Student needs to appear in the same subject of R-2001