UNIVERSITY OF MUMBAI

Bachelor of Biomedical Engineering

Third Year and Final Year Engineering

Sem. V

Revised course (Rev- 2012)

From Academic Year 2012 -13

Under

FACULTY OF TECHNOLOGY

(As per Semester Based Credit and Grading System)

Syllabus Scheme for T.E. Semester V Biomedical Engineering

Sub Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Pract.	Tut	Theory	Pract.	Tut	Total
TEBM501	Biomedical Instrumentation-I	4	2	-	4	1	-	5
TEBM502	Microprocessors	4	2	-	4	1	-	5
TEBM503	Analog and Digital Circuits Design	4	2	-	4	1	-	5
TEBM504	Biomedical Digital Signal Processing	4	2	-	4	1	-	5
TEBM505	Principles of Communication Engineering	4	2	-	4	1	-	5
TEBM506	Business Communication and Ethics	-	2*+2	-	-	2	-	2
	TOTAL	**20**	**14**	**-**	**20**	**7**	**-**	**27**

* Theory for entire class to be conducted

Sub Code	Subject Name	Examination scheme							
		Theory Marks				Term work	Pract.	Oral	Total
		Internal Assessment			End Sem exam				
		Test 1	Test 2	Avg.					
TEBM501	Biomedical Instrumentation-I	20	20	20	80	25	-	25	150
TEBM502	Microprocessors	20	20	20	80	25	25	-	150
TEBM503	Analog and Digital Circuits Design	20	20	20	80	25	25	-	150
TEBM504	Biomedical Digital Signal Processing	20	20	20	80	25	-	25	150
TEBM505	Principles of Communication Engineering	20	20	20	80	25	-	25	150
TEBM506	Business Communication and Ethics	-	-	-	-	50	-	-	50
TOTAL				**100**	**400**	**175**	**50**	**75**	**800**

Syllabus Scheme for T.E. Semester V Biomedical Engineering

Sub Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Pract.	Tut	Theory	Pract.	Tut	Total
TEBM501	Biomedical Instrumentation-I	4	2	-	4	1	-	5
TEBM502	Microprocessors	4	2	-	4	1	-	5
TEBM503	Analog and Digital Circuits Design	4	2	-	4	1	-	5
TEBM504	Biomedical Digital Signal Processing	4	2	-	4	1	-	5
TEBM505	Principles of Communication Engineering	4	2	-	4	1	-	5
TEBM506	Business Communication and Ethics	-	2*+2	-	-	2	-	2
	TOTAL	**20**	**14**	**-**	**20**	**7**	**-**	**27**

* Theory for entire class to be conducted

Sub Code	Subject Name	Examination scheme							
		Theory Marks				Term work	Pract.	Oral	Total
		Internal Assessment			End Sem exam				
		Test 1	Test 2	Avg.					
TEBM501	Biomedical Instrumentation-I	20	20	20	80	25	-	25	150
TEBM502	Microprocessors	20	20	20	80	25	25	-	150
TEBM503	Analog and Digital Circuits Design	20	20	20	80	25	25*	-	150
TEBM504	Biomedical Digital Signal Processing	20	20	20	80	25	-	25	150
TEBM505	Principles of Communication Engineering	20	20	20	80	25	-	25	150
TEBM506	Business Communication and Ethics	-	-	-	-	50	-	-	50
TOTAL				**100**	**400**	**175**	**50**	**75**	**800**

*Both practical and oral examination

Sub Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Pract.	Tut	Theory	Pract.	Tut	Total
TEBM501	Biomedical Instrumentation-I (abbreviated as BMI-I	4	2	-	4	1	-	5

Sub Code	Subject Name	Examination scheme							
		Theory Marks				Term work	Pract.	Oral	Total
		Internal Assessment			End Sem exam				
		Test 1	Test 2	Avg.					
TEBM501	Biomedical Instrumentation-I	20	20	20	80	25	-	25	150

Course Objectives	With an invent of various new diseases and anomalies the correct diagnosis of the patient has become a real challenge. The medical awareness among patients and various litigations point to a need of newer diagnostics equipment. Advancement of technology in biomedical engineering has resulted in various state of art diagnostics equipment. To enable students to understand the basic principal, working and design of various automated diagnostic equipment.
Course Outcomes	Students will demonstrate the principles of electronics used in designing various diagnostic equipment. Students will be able to understand the working principle and applications of various diagnostic equipment. Students who can participate and succeed in competitive exams.

Module	Contents	Time
1.	**Basic principle, technical specification, working and applications of Laboratory Instruments.** 1. Spectrophotometer 2. Colorimeter 3. Electrolyte Analyser 4. Blood cell counter 5. Auto-analyser 6. Blood gas analyser	10
2.	**Basic principle, technical specification, working and applications of Laboratory Instruments.** Electrophoresis and types Chromatography ELISA concepts (direct and indirect), reader & washer Microscopes and its types: optical compound, electron microscope, fluorescence	10

	microscope.	
3.	**Blood Flow Measurement:** Electromagnetic, Ultrasonic, NMR and Laser Doppler flowmetry, cardiac output measurement, impedance plethysmography.	08
4.	**Pulmonary Function Analyser and Ventilator:** Respiration measurement technique: Lung volume and capacities. Spirometry, Pulmonary function measurement and analyser, Oximetry, Ventilators and Anesthesia Equipment	12
5.	**Heart Lung machine and types of artificial oxygenator**	03
6.	**Audiometers:** Basic audiometer, Pure tone and Speech audiometer, evoked response Audiometry.	05

Text books:

1. Handbook of Biomedical Enginerring By R.S. Khandpur (TMH Pub).
2. Handbook of Analytical Instruments By R.S. Khandpur (TMH Pub).
3. Medical Instrumentation, Application and Design By J.G. Webster.
4. Medical Electronics – A.G. Patil ,R K Jha, R Hariharan(Excel Books, New Delhi)

Reference Books:

1. Encyclopedia of medical devices and instrumentation - J.G. Webster Vol I, II, III, IV (John Willey).
2. Introduction to Biomedical Equipment Technology By Carr.-Brown (Pearson Education Pub)
3. Introduction to Biomedical Engineering – Joseph Bronzino (CRC Press)
4. Various Instruments Manuals
5. Various internet resources

Internal Assessment (IA):

Two tests must be conducted which should cover at least 80% of syllabus. The average marks of both the tests will be considered for final Internal Assessment.

End Semester Examination:

Question paper will comprise of 6 questions, each carrying 20 marks.
The students need to solve total 4 questions.
Question No.1 will be compulsory and based on entire syllabus.
Remaining question (Q.2 to Q.6) will be selected from all the modules.

Term Work:

Term work consists of minimum eight experiments. The distribution of the term work shall be as follows:

Laboratory work (Experiments and Journal) :15 marks
Attendance (Practical and Theory) :10 marks

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and completion of journal. Term work assessment must be based on the overall performance of the student.

Sub Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Pract.	Tut	Theory	Pract.	Tut	Total
TEBM502	Microprocessors (abbreviated as MP)	4	2	-	4	1	-	5

Sub Code	Subject Name	Examination scheme							
		Theory Marks				Term work	Pract.	Oral	Total
		Internal Assessment			End Sem exam				
		Test 1	Test 2	Avg.					
TEBM502	Microprocessors	20	20	20	80	25	25	-	150

Course Objectives	To develop background knowledge and core expertise in microprocessor. To study the concepts and basic architecture of 8086 Pentium processor and Co-processor 8087. To know the importance of different peripheral devices and their interfacing to 8086. To know the design aspects of basic microprocessor based system. To write assembly language programs in microprocessor for various applications.
Course Outcomes	Students will learn The architecture and software aspects of microprocessor 8086 Assembly language program in 8086 for various applications. Co-processor configurations. Various interfacing techniques with 8086 for various applications. Basic concepts of 8087 Co-processor.

Module	Contents	Time
1.	**Introduction to Microprocessor** Introduction to Microprocessor and Microcontroller, Microcomputer based system elements ,Generalized block diagram of Microprocessor, RISC & CISC CPU Architectures, Harvard & Von-Neumann CPU architecture, Microprocessor Programming languages, Microcomputer System software, Evolution of Microprocessor	04
2.	**Architecture of Intel 8086 Microprocessor** 8086 Architecture and organization, Pin configuration, Pin Functions, Memory segmentation concept, Minimum and Maximum modes of 8086, 8288 Bus Controller, Read and Write bus cycle of 8086, 8086 Memory organization	08
3.	**Instruction set and Programming of 8086** 8086 Addressing modes,8086 Instruction encoding formats and instruction set, Assembler directives, 8086 programming and debugging of assembly language program	10
4.	**Memory Interfacing with 8086:**	04

	Introduction, Address Decoding, Interfacing 8086 with RAM and ROM, Comparison between Memory Mapped I/O and I/O Mapped I/O	
5.	**Peripherals interfacing with 8086** 8086Interrupt structure, Programmable interrupt controller 8259,8259 interfacing with 8086,Programmable Peripheral Interface 8255, , 8086 interfacing with ADC, keyboard and seven segment display using 8255, DMA controller 8237,8086 interfacing with 8237	10
6.	**8087 Math coprocessor** Introduction, 8087 Architecture, Interfacing of 8086 with 8087, 8087 Instruction set, Assembly language Programming based on 8086-8087 system	12

List of Experiments:

1. 16 bit Arithmetic operations - Addition, Subtraction, Multiplication, Division using 8086
2. Logical operations – AND, OR, NOT using 8086
3. Searching Largest and smallest number using 8086
4. Sorting –the numbers in Ascending and Descending order using 8086
5. Code Conversion using 8086 (BCD to Hex, BCD to binary, Hex-BCD etc.)
6. String Manipulation using 8086
7. Interfacing ADC with 8086
8. Interfacing DAC with 8086
9. Parallel Communication between two microprocessor kits using Mode 1 and Mode 2 of 8255.
10. Interfacing 8259 using 8086
11. Computation of area of circle using 8087.
12. Computation of Hypotenuse using 8087.
13. Computation of Roots of Quadratic equation using 8087.

Text books:

1. "8086/8088 family: "Design, Programming an Interfacing", John Uffenbeck: Prentice Hall, 2nd Edition
2. Microcomputer systems 8086/8088 family, Architecture, Programming and Design - Yu-Cheng Liu & Glenn A Gibson, 2nd Edition- July 2003, Prentice Hall of India.
3. "Advanced Microprocessor and Peripherals – Architecture, Programming and Interfacing", A.K.Ray & K.M Bhurchandi, Tata Mc Graw Hill , 2006.

Reference Books:

1. "Microprocessors and Interfacing : Programming and Hardware", Douglas V.Hall, second edition , Tata Mc Graw Hill ,2006.
2. " IBM PC Assembly language and programming"Peter Abel, , fifth edition
3. "Pentium Processor System Architecture", Don Anderson, Tom Shanley: MindShare Inc., 2nd Edition

Internal Assessment (IA):

Two tests must be conducted which should cover at least 80% of syllabus. The average marks of both the tests will be considered for final Internal Assessment.

End Semester Examination:
Question paper will comprise of 6 questions, each carrying 20 marks.
The students need to solve total 4 questions.
Question No.1 will be compulsory and based on entire syllabus.
Remaining question (Q.2 to Q.6) will be selected from all the modules.

Term Work:
Term work consists of minimum eight experiments. The distribution of the term work shall be as follows:

Laboratory work (Experiments and Journal)	:15 marks
Attendance (Practical and Theory)	:10 marks

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and completion of journal. Term work assessment must be based on the overall performance of the student.

Sub Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Pract.	Tut	Theory	Pract.	Tut	Total
TEBM503	Analog and Digital Circuits Design (abbreviated as ADCD)	4	2	-	4	1	-	5

Sub Code	Subject Name	Examination scheme							
		Theory Marks				Term work	Pract.	Oral	Total
		Internal Assessment			End Sem exam				
		Test 1	Test 2	Avg.					
TEBM503	Analog and Digital Circuits Design	20	20	20	80	25	25*	-	150

*Both practical and oral examination

Course Objectives	To understand and provide knowledge of various Analog And Digital Circuits Such as Timer IC 555, PLL IC, VCO, 723 voltage regulator . To understand different types of filters and design them for the given specifications
Course Outcomes	To acquire the ability to design practical circuits by selecting proper IC chips needed for a particular application

Module	Contents	Time
1.	**Waveform Generation IC's:** • IC 555 Functional Block diagram, Circuit diagram. • IC 555 in Astable Multivibrator(AMV) functional diagram, circuit diagram with application • IC 555 in Monostable Multivibrator (MMV) functional diagram, circuit diagram with application • PLL (IC 565 or equivalent) circuit diagram, and its applications • VCO(IC 566) Circuit diagram and its applications. Function Generator (IC 8038 or equivalent) Circuit diagram and its applications	12
2.	**Special Function IC's:** • F-V convertors and V-F convertors: Circuit diagram and its applications • Instrumentation Amplifier (AD 624 /AD 620) Circuit diagram and its applications, • Monolithic Isolation Amplifier module • Opto-couplers and Opto-isolators PWM (SG 3525 or equivalent) Circuit diagram and its applications	06
3.	**Active Filters:** • Frequency response, design of first order (LP, HP, BP) filter and applications. • Frequency response, design of 2^{nd} order (Chebyshev, Butterworth, Elliptical	12

	filters) LP, HP, BP, All pass, Notch, band reject • KRC filter. • Capacitor filter, switched capacitor filter. Generalized Impedance Convertor (GIC)	
4.	**Power Devices and Circuits:** • SCR's: Basic structure, characteristics, Two transistor and Operations. series and parallel connections of SCRs. • DIAC and TRIAC: Basic Structure and characteristics, applications • UJT: Operation, characteristics, parameters and UJT as a relaxation oscillator Power MOSFET : Device structure, equivalent circuit and characteristics	06
5.	**Voltage Controllers and Regulators :** • Analog switches, Relays : Basic Types • Functional block diagram of Voltage Regulators • Types of voltage regulators: Fixed voltage regulators (78XX and 79XX), Adjustable voltage regulators, linear voltage regulator IC 723, Design of low voltage regulator and high voltage regulator using 723. Switching Mode Power Supply (SMPS)	06
6.	**Motors And Drivers :** Stepper, Servo, DC/AC Motors drivers and geared motors (Basic operation and application)	06

List of Experiments:

1. Design AMV for Duty cycle >=50%
2. Design MMV given duty cycle
3. Application of AMV square wave generator /
4. Application of MMV as a missing pulse detector / frequency divider
5. PLL
6. VCO
7. Function Generator IC
8. Design for Band pass Filter /Band reject
9. Design of Notch filer / Twin T filter
10. Design of Low Pass Filter/ High pas Filter
11. Instrumentation Amplifier
12. IC 723 Voltage regulator

Text books:

1. Op-Amps and linear integrated circuits – R. Gayakwad
2. Linear Integrated Circuits: Roy Chaudhary
3. Design with operational amplifiers and analog integrated circuits. Sergio Franco,
4. Integrated Circuits K.R.Botkar.
5. Power Electronics, Ned Mohan.
6. Power Electronics, M.H.Rashid.
7. Power Electronics, M.D.Singh and K.B.Khanchandani,

Reference Books:

1.Integrated Electronics –Millman & Halkias
2. Opamps and linear integrated circuits, Theory and Applications- James Fiore.
3. Power Electronics, P.C.Sen.
4. Power Electronics, Dr.P.S.Bimbhra,

Internal Assessment (IA):

Two tests must be conducted which should cover at least 80% of syllabus. The average marks of both the tests will be considered for final Internal Assessment.

End Semester Examination:

Question paper will comprise of 6 questions, each carrying 20 marks.
The students need to solve total 4 questions.
Question No.1 will be compulsory and based on entire syllabus.
Remaining question (Q.2 to Q.6) will be selected from all the modules.

Practical and Oral Examination:

Practical and oral examination will be based on experiments performed during the term and the course - project.

Term Work:

Term work consists of minimum six experiments and a mini – project based on the syllabus. The distribution of the term work shall be as follows:
Laboratory work (Experiments, mini - project and Journal) :15 marks
Attendance (Practical and Theory) :10 marks

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and completion of journal. Term work assessment must be based on the overall performance of the student.

Sub Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Pract.	Tut	Theory	Pract.	Tut	Total
TEBM504	Biomedical Digital Signal Processing (abbreviated as BDSP)	4	2	-	4	1	-	5

Sub Code	Subject Name	Examination scheme							
		Theory Marks				Term work	Pract.	Oral	Total
		Internal Assessment			End Sem exam				
		Test 1	Test 2	Avg.					
TEBM504	Biomedical Digital Signal Processing	20	20	20	80	25	-	25	150

Course Objectives	After active participation in this course students will be able to: Understand the fundamental techniques and applications of digital signal processing with emphasis on biomedical signals. Students should be able to do the following upon completion of this course Understand the basics of discrete time signals Understand Circular and linear convolution and their implementation using DFT Analyse signals using discrete Fourier transform Understand efficient computation techniques such as DIT and DIF FFT algorithms Design of FIR filters using window method Design of digital IIR filters by designing prototype analog filters and then applying analog to digital conversion
Course Outcomes	This course will enable the students to: Understand discrete time signals and systems and their classification. It will also equip them to design and implement various Digital filters and filter discrete time signals.

Module	Contents	Time
1.	Basic Elements of DSP concepts of frequency in analog and digital signals –sampling theorems –Discrete time signals and systems- Properties –Z-transform- linear & circular convolution- Correlation –DTFT	08
2.	Introduction to DFT-Properties of DFT,	06
3.	Introduction DIT and DIF FFT algorithms. Use of FFT in linear filtering, Discrete Cosine transforms	06
4.	Review of Design of analog Butterworth and Chebyshev Filters, Frequency transformation in analog domain, Design of IIR Digital Filters using Impulse invariance method-Design of digital Filters using Bilinear transformation	12
5.	Structure of FIR filters-Linear phase filters –Filter design using window technique-Frequency sampling techniques –Finite Word length effects in digital filters. Realisation of FIR &IIR filters Direct ,cascade and parallel forms	10

6.	Introduction to Digital signal Processors–Architecture –Features-addressing formats –functional mode-introduction to commercial Processors. Application of DSP in Biomedical Applications	06

List of Experiments:

1. Basics of Programming
2. Simulations of standard signals
3. Concept of Aliasing
4. Linear convolution circular convolution
5. Discrete Fourier Transform(DFT)
6. Design and simulation of FIR filter
7. IIR filters using Butterworth approximation
8. IIR filter using Chebyshev approximation

Text books:

1. Digital signal processing Principles Algorithms and Application –Proakis &Manolakis – Third edition PHI
2. Digital Signal Processing –Sanjit K. Mithra Tata Mc-graw Hill
3. Digital Signal Processing – S. Salivahanan, C.Gnanapriya, 2/ed Tata McGraw Hill

Reference Books:

1. Digital signal processing – A.V. Oppenheim and R.W.Schafer- PHI
2. Understanding Digital Signal Processing –Richard G. Lyons-3/ed Pearson Publication

Internal Assessment (IA):
Two tests must be conducted which should cover at least 80% of syllabus. The average marks of both the tests will be considered for final Internal Assessment.

End Semester Examination:
Question paper will comprise of 6 questions, each carrying 20 marks.
The students need to solve total 4 questions.
Question No.1 will be compulsory and based on entire syllabus.
Remaining question (Q.2 to Q.6) will be selected from all the modules.

Term Work:
Term work consists of minimum eight experiments. The distribution of the term work shall be as follows:
Laboratory work (Experiments and Journal) :15 marks
Attendance (Practical and Theory) :10 marks
The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and completion of journal. Term work assessment must be based on the overall performance of the student.

Sub Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Pract.	Tut	Theory	Pract.	Tut	Total
TEBM505	Principles of Communication Engineering (abbreviated as PCE)	4	2	-	4	1	-	5

Sub Code	Subject Name	Examination scheme							
		Theory Marks				Term work	Pract.	Oral	Total
		Internal Assessment			End Sem exam				
		Test 1	Test 2	Avg.					
TEBM505	Principles of Communication Engineering	20	20	20	80	25	-	25	150

Course Objectives	This subject provides introduction to the basic principles and techniques used in analog and digital communications. The subject then focuses on developing an understanding of the principles and techniques of analog modulation as well as digital modulation. Communication transmitters and receivers techniques are discussed for different transmission conditions. The subject then covers a range of digital modulation techniques which are frequently used in modern communication systems. Subject Name also include the advantages, disadvantages and application of all communication techniques.
Course Outcomes	Students will be familiar with all the communication techniques. And they are able to use in biomedical application

Module	Contents	Time
1.	**Introduction to communication system :** Elements of communication system, types of communication system, Noise, Signal to Noise ratio, Noise factor, Noise figure, Noise Temperature	04
2.	**Amplitude Modulation :** Mathematical analysis of Am wave, Different types of AM Spectrum, Bandwidth, waveform, DSBFC(Grid Modulated, Plate Modulated, Collector Modulated),DSBSC(FET Balanced Modulator, Ring Diode modulator),SSB(Phase shift method, Filter method, Third method) and Introduction of ISB and VSB, Low level and high level modulator transmitter **AM Receiver:** Receiver Parameters sensitivity, selectivity, fidelity, double spotting, Image frequency and its rejection, dynamic range TRF receiver, superetrodyne receiver, double conversion receiver AM detectors –Simple and Practical Diode detector, Principles and types of tracking,	13

	Principles and types of AGC, Demodulation of DSBSC and SSB waves	
3.	**FM Modulation :** Principles of FM waveform, spectrum, Bandwidth ,FM generation – Direct and Indirect FM, Principles of AFC, Pre-emphasis and Deemphasise in FM, Effect of noise in FM, Noise Triangle FM demodulation – Simple Slope detector, Balanced slope detector, Foster Seeley discriminator, Ratio detector, Quadrature detector, Block diagram of FM receivers, Capture effect in FM receivers, Difference between AM and FM system	09
4.	**Analog Pulse Modulation Techniques :** Sampling Theorem for low pass signals and band pass signals, Proof of Sampling theorem, Concept of Aliasing, PAM, PWM,PPM – Generation, Detection, Advantages, Disadvantages, comparison	06
5.	**Digital Pulse Modulation And Transmission Techniques :** Advantages and Disadvantages of digital transmission, PCMTrasmitter, Receiver, Quantization, Companding, DPCM,DM,ADM – Transmitter, Receiver, Advantages and Disadvantages Digital Transmission – Types of digital transmission (ASK,FSK,PSK) Generation, Detection, Advantages Disadvantages	11
6.	**Multiplexing techniques :** Concept of multiplexing and multiple access, FDM, TDM Transmitter and Receiver, Hierarchy, Application, Advantages Disadvantages, PCM-TDM system, FDMA, TDMA, CDMA	05

List of Experiment:

1. DSB-SC, DSB-FC, SSB AM generation and detection
2. FM generation and detection
3. Pre-emphasis and De-emphasis
4. Sampling and reconstruction
5. PAM generation and detection
6. PWM generation and detection
7. PPM generation and detection
8. PCM generation and detection
9. DM generation and detection
10. Time division multiplexing
11. Frequency division multiplexing

Text books:

1. Electronic communication system – Wayne Tomasi,Pearson Education
2. Electronic communication system – Roy Blake, Thomson Learning
3. Electronic communication system - Kennedy and Devis,TMH

Reference Books:

1. Digital and Analog communication system – Leon W Couch, Pearson Education
2. Principles of communication system – Taub and Schilling ,TMH

Internal Assessment (IA):
Two tests must be conducted which should cover at least 80% of syllabus. The average marks of both the tests will be considered for final Internal Assessment.

End Semester Examination:
Question paper will comprise of 6 questions, each carrying 20 marks.
The students need to solve total 4 questions.
Question No.1 will be compulsory and based on entire syllabus.
Remaining question (Q.2 to Q.6) will be selected from all the modules.

Term Work:
Term work consists of minimum eight experiments. The distribution of the term work shall be as follows:

Laboratory work (Experiments and Journal)	:15 marks
Attendance (Practical and Theory)	:10 marks

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and completion of journal. Term work assessment must be based on the overall performance of the student.

Sub Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Pract.	Tut	Theory	Pract.	Tut	Total
TEBM506	Business Communication and Ethics (abbreviated as BCE)	-	2*+2	-	-	2	-	2

* Theory for entire class to be conducted

Sub Code	Subject Name	Examination scheme							
		Theory Marks				Term work	Pract.	Oral	Total
		Internal Assessment			End Sem exam				
		Test 1	Test 2	Avg.					
TEBM506	Business Communication and Ethics	-	-	-	-	50	-	-	50

Course Objectives	
Course Outcomes	

Module	Contents	Time