GONDWANA UNIVERSITY, GADCHIROLI
Four Year Degree Course in Engineering and Technology
Course and Examination Scheme with Credit Grade System
Sixth Semester B.E. (Instrumentation Engineering)

Subject Code	Subject	Teaching Scheme				Examination Scheme									
		Hours Per Week			Number of Credits	THEORY						PRACTICAL			
		L	T	P		Duration of Paper (Hrs.)	Max. Marks ESE	Max. Marks Sessional		Total	Min. Passing Marks	Max. Marks TW	Max. Marks POE	Total	Min. Passing Marks
								MSE	IE						
IN601	Professional Management Techniques	3	0	0	3	3	80	10	10	100	40	--	--	--	--
IN602	Bio-Medical Instrumentation-I	3	1	0	4	3	80	10	10	100	40	--	--	--	--
IN603	Control System Design	3	1	0	3	3	80	10	10	100	40	--	--	--	--
IN604	Microcontroller and its Applications	3	1	0	3	3	80	10	10	100	40	--	--	--	--
IN605	Digital Signal Processing	3	1	0	3	3	80	10	10	100	40	--	--	--	--
Laboratories															
IN606	Bio-Medical Instrumentation-I	0	0	3	2	--	--	--	--	--	--	25	25	50	25
IN607	Microcontroller and its Applications	0	0	3	2	--	--	--	--	--	--	25	25	50	25
IN608	Digital Signal Processing	0	0	3	2	--	--	--	--	--	--	25	25	50	25
IN609	Programming Practice IV: LabVIEW	0	0	2	2	--	--	--	--	--	--	25	--	25	12
IN610	Personal Proficiency	0	0	2	2	--	--	--	--	--	--	25	--	25	12
Total		**15**	**4**	**13**	**26**	--	--	--	--	**500**	--	--	--	**200**	--
Semester Total		**32**												**700**	

GONDWANA UNIVERSITY, GADCHIROLI

FACULTY OF ENGINEERING AND TECHNOLOGY

CONSLIDATED STATEMENT OF VARIOUS PARAMETERS IN TEACHING & EXAMINATION SCHEME OF

B.E. (INSTRUMENTATION ENGINEERING)

SR.NO.	SEMESTER	NO. OF THEORY SUBJECTS	NO OF LABS/PRACT	TEACHING HOURS(TH) (L+T)	TEACHING HOURS (PRACT)	TOTAL CREDIT	MAX. THEORY MARKS	MAX.PRACT MARKS	MAX. MARKS TOTAL
1	I	--	--	--	--	--	--	--	--
2	II	--	--	--	--	--	--	--	--
3	III	5	4	20	11	25	500	200	700
4	IV	5	4	20	11	25	500	200	700
5	VI	5	4	20	11	26	500	200	700
6	VI	5	4	19	13	26	500	200	700
7	VII	4	4	16	13	23	400	250	650
8	VIII	4	4	16	15	25	400	250	650
		28	24	111	74	150	2800	1300	4100

*Audit course. It is neither considered as passing head nor considered for earning some credit(s). However, this is mandatory to be taken up at the respective college level

Subject wise Board of Studies Affiliation

Board of Studies	Subject Codes
APPLIED SCIENCES & HUMANITIES	IN301, IN401, IN601
ELECTRICAL ENGINEERING	IN503
INSTRUMENTATION ENGINEERING	Rest all ,except above enlisted

VI Semester B.E.
Instrumentation Engineering

VI Semester B.E. Instrumentation Engineering

Course Code   **: IN601**

Title of the Course   **: Professional Management Techniques**

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
3	0	0	3	3	3	10	10	80	100

Units	Contents	Hours
1	**Management Science:** Management, its growth, concepts of administration and management of organization, Definition of management, functions, authority and responsibility. Unity of command and direction Decision making in management by objectives. **Business Organization:** Different forms of organization, their formation and working, Different organization structure- line organization, functional organization, line and staff organization	09
2	**Personnel Management:** Manpower planning, sources of recruitment, selection and training of staff. Job evaluation, merit rating, performance appraisal, wage administration and system of wage, Payment, incentive, motivations, industrial fatigue, Trade unions – industrial relations.	09
3	**Purchase and stores management:** Concepts of quotation, tenders and comparative statement, inspection and quality control, Inventory, carrying cost and fixed cost of inventory, examples of cost of Inventory, Stores management, functions of storekeeper, methods of inventory: LIFO, FIFO.	09
4	**Marketing management:** Concepts of selling, marketing, definition of marketing, market research and of pricing, penetration, pricing, skimming pricing, distribution of product, advertising and promotion	09
5	**Export and import management:** Concepts of international trade, duties, antidumping duty, cost involved in exporting a Product, pricing of export product. Government aids for export promotion, export houses, Export promotion counsel, MODVAT, patent and patent rights.	09

	Quality Management: TQM, quality circles, ISO systems.	
	Total	**45**

TEXT BOOKS:
1. Business Organization and Management by G.R. Basu, Tata Mc-Graw Hill.
2. Business of Industrial Management by O.P. Khanna, Dhanpat Rai Publication.

REFERENCE BOOKS:
1. Management for Business and Industry by C.S. George Jr., Prentice-Hall Publication.
2. Principles of Management by P. C. Tripathi and P. N. Reddy, Tata Mc-Graw Hill.
3. Business Organization and Management by M.C. Shulka, S. Chand Publication.

VI Semester B.E. Instrumentation Engineering

Course Code   **: IN602**

Title of the Course   **: Bio-Medical Instrumentation-I**

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
3	1	0	4	4	3	10	10	80	100

Unit	Contents	Hours
1	**Introduction to cell, Blood:** Characteristics of blood, physiology of blood clotting. Heart (Circulatory System): Anatomy of heart and blood vessels, origin and conduction of heart beat, cardiac cycle, electrocardiogram, blood pressure, control of cardiac cycle.	9
2	**Introduction to Fundamental of Medical Instrumentation:** Sources of Biomedical Signals, Basic medical Instrumentation system, Performance requirement of Medical Systems, Intelligent Medical Instrumentation Systems, General constraints in Design of Medical Instrumentation Systems and Regulation of Medical devices	9
3	**Bioelectric Signals & Biosensor:** Origin of Bioelectric Signals, Recording electrodes & its types, Electrochemical Sensors, chemical fibro-sensors, Blood glucose Sensor and Smart Sensors, Measurement of Heart & Pulse rate, Blood pressure,pH,pCO_2 and $pO_2$and cardiac output and Blood cell counter	9
4	**Recording Systems:** Basic Recording Systems, General Considerations for Signal Conditioners, Preamplifiers, Sources of Noise in low level measurements, Biomedical Signal Analysis Techniques, The main Amplifier and Driver stage, Writing Systems & its types and Recorder such as ECG, VCG,PCG Digital Recorders	9
5	**Clinical Laboratory Instruments:** Medical diagnosis with Chemical tests, Spectrophotometery ,Spectrophotometer type Instruments, Colorimeters, Automated Biomechanical Analysis System, Clinical flame Photometers, Selective-ion electrodes Electrolytes Analyzer, Pacemaker, Defibrillator.	9
	Total	**45**

TEXT BOOKS:

1. A Handbook of Biomedical Instrumentation by R. S. Khandpur, Publication: Tata McGraw Hill Eleventh reprint Edition: Second Ed., 2008.
2. Text book of Medical Physiology , by Guyton & Hall, Elsevier Publication, Edition: 12th edition.

REFERENCE BOOKS:

1 Introduction to Biomedical technology by Joseph J. Carr and John M. Brown Publication : Pearson Education India(PHI), 4th Edition (7th Impression) 2011
2 Bioinstrumentation by John G.Webster, Publications: John Wily and Sons, Inc 2004.
3 Medical Instrumentation Application and Design by John G.Webster, Publications: John Wily and Sons, Inc Edition: Reprint 2011.
4 Anatomy and Physiology by Wilson and Wangh, publication : Elsevier, Edition: 11th edition
5 Human Physiology Vol.- I & II. by C. C. Chatterjee
6 Human Physiology, by A. V. James & D. L. Sherman, McGraw Hill Publication Edition: 9th edition.
7 Biomedical Instrumentation by Cromwell, PHI Publication.

VI Semester B.E. Instrumentation Engineering

Course Code   **: IN603**
Title of the Course   : Control System Design

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
3	1	0	4	3	3	10	10	80	100

Unit	Content	Hours
1	**Time Domain Design of Control System**: Cascade Compensation in time domain, Lead, Lag, Lead – Lag Compensation using Root Locus technique, Pole zero Cancellation control, Bridged-T network, Principles of Compensation in A.C. System.	10
2	**Frequency Domain Design of Control System:** The design Problem , Preliminary consideration of Classical design , Realization of basic compensators , cascade Compensation infrequency domain , Phase Lead , Lag , Lead-Lag Controllers and their transfer function , bode plot, Design procedures for Compensators , effects and limitations.	09
3	**State Variable Analysis and Design of Linear System:** Concept of State , State Variables and state model , state space representation using Physical , Phase , Canonical variables , State models and transfer function, diagonalization, solution of state equation, Concept of Controllability and Observability and their criterion , state feedback control , Pole Placement design	10

	through state feedback.		
4	**Introduction to Optimal Control System:** Analytical approach of parameter optimization with simple example, Performance indices and its minimization with simple examples.	07	
5	**Nonlinear System Analysis:** Behavior of nonlinear system, common physical nonlinearities, Phase plane method , Singular points , Stability of Nonlinear system , describing function method, Stability analysis of describing function method,	09	
		Total	**45**

TEXT BOOKS:

1. Control System Engineering by I.J.Nagrath , M. Gopal, New Age International Publishers .
2. Modern Control Engineering by *Katsuhiko Ogata,* Prentice Hall publication

REFERENCE BOOKS:

1. Control System Principles and Design by M.Gopal, Tata McGraw Hill Education Private Limited
2. Automatic Control System by B.C.Kuo, John Wiley India.
3. Modern Control theory : M.Gopal , New Age International Publishers
4. Control system engineering, Norman Nise, Wiley India.

VI Semester B.E. Instrumentation Engineering

Course Code : **IN604**

Title of the Course : **Microcontroller and its Applications**

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
3	1	0	4	3	3	10	10	80	100

Units	Contents	Hours
1	8051 Microcontroller: Overview of 8051 family, Assembly Language programming, Jump loop and call instructions, I/O port programming, addressing modes.	08
2	Arithmetic, logic Instructions and programs, 8051 programming in C, Hardware connection and Intel Hex file	08
3	TIMER, Serial port, Interrupts programming in assembly and C.	10
4	LCD and keyboard interfacing, ADC/DAC and sensor interfacing, Interfacing to external memory, Interfacing with 8255	09
5	PIC Microcontrollers: PIC Architecture, PIC I/O Port Programming, Arithmetic, Logic Instructions, and Programs, Bank Switching, Table Processing, Macros, and Modules. PIC Programming in Assembly and C: PIC18F Hardware Connection and ROM Loaders, PIC18 Timer, PIC18 Serial Port, Interrupt, LCD and Keyboard Interfacing, ADC, DAC, and Sensor Interfacing, SPI Protocol and DS1306 RTC Interfacing, Motor Control, I2C protocol.	10
	Total	**45**

TEXT BOOK:

1. 8051 Microcontroller and Embedded Systems using Assembly and C by Muhammad Ali Mazidi, Janice Gillispie Mazidi and Rolin D.MacKinlay, Pearson Education, Second Edition.

2. PIC Microcontroller and Embedded Systems: Using assembly and C for PIC 18 by Muhammad Ali Mazidi, Rolin McKinlay, Danny Causey.

REFERENCE BOOKS:

1. Microprocessor and Microcontroller by R. Theagarajan, Sci Tech Publication, Chennai.
2. Architecture, Programming, Interfacing and System Design by Raj Kamal, Pearson Education.
3. The 8051 Microcontroller Architecture, Programming and Applications by Kenneth J.Ayala, Penram International.

VI Semester B.E. Instrumentation Engineering

Course Code   **: IN605**

Title of the Course   **: Digital Signal Processing**

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/week	Credits	Duration of paper, hrs	MSE	IE	ESE	Total
3	1	0	4	3	3	10	10	80	100

Units	Contents	Hours
1	Review of Discrete time systems, Z transform & properties, DFT its properties, radix 2 decimation in time FTT and IFFT, radix 2 decimation in frequency FFT & IFFT	9
2	**Structure of FIR and IIR filters:** Structures for realization of discrete time systems, Basic structures for FIR systems: direct form, cascade form, lattice structure, frequency sampling structure. Basic structure for IIR systems: Direct forms I,II, cascade, parallel forms, lattice and lattice-ladder structures, transposed forms.	10
3	**FIR Filters :** Introduction to FIR filters, linear phase filters, symmetric and anti symmetric filters, Window method, frequency sampling method . Design of FIR filters using Kaiser Window. Comparison of design methods for linear phase FIR filters.	9
4	**IIR Filters :** Introduction to IIR filters, Butterworth approximation, Chebyshev approximation, Design of IIR filter: impulse invariance method, bilinear transformation, approximation derivative method, Frequency transformations: low pass to high pass, band pass, band reject. Comparison between FIR and IIR filters	10
5	**Multirate Digital Signal Processing :** Introduction, Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion by a rational factor I/D, Implementation of	07

	sampling rate conversion, Applications of multi rate signal processing, Introduction to digital filter banks.	
	Total	**45**

TEXT BOOKS:

1. John G. Proakis,Dimitris G. Manolakies "Digital signal processing Principals, Algorithms, and Applications" Pearson Education
2. Ashok Ambardar, "Digital Signal Processing A modern approach", Cengage learning
3. Digital Signal Processing by S Salivahanan, C Gnanapriya, TMH,2e

REFERENCES:

1. S. K. Mitra, "Digital Signal Processing: A Computer based Approach", TMH, 2001.
2. Oppenheim A. V and R. W. Schafer, "Discrete Time Signal Processing", Person Education,India
3. Rabnier, Gold, "Theory and Applications of Digital Signal Processing", TMH

VI Semester B.E. Instrumentation Engineering

Course Code : **IN606**

Title of the Course : **Bio-Medical Instrumentation-I Laboratory**

Course Scheme				Evaluation Scheme (Laboratory)		
Lecture	Tutorial	Practical	Credits	TW	POE	Total
0	0	3	2	25	25	50

Course Objective:
- To understand anatomy and physiology of cardiovascular system, heart, pacemaker, and regulation of Medical devices.
- To study different electrodes stimulators Biosensor.
- To understand, design and implement various biomedical signal amplifiers writing systems.
- To understand recorders such as ECG, VCG and PCG etc.

Term Work (TW) & POE:
Term work and practical/Oral examination shall consist of at least ten experiments based on contents of syllabi given in the course code IN602 in the form of a journal and necessary documentation.

Suggested list of Experiments:
1) To study different charts and models of Human Anatomy
2) To study different types of Biosensor like electrodes, stimulators, pneumotach and skin sensor.
3) To measure galvanic skin resistance
4) To measure Heart Rate and pulse rate of normal patient
5) To measure blood pressure of normal patient by using oscultatory and Oscillometric methods.
6) To measure Heart sound of normal patient by using PCG
7) To study different normal Biomedical simulated signals
8) To study different abnormal Biomedical simulated signals
9) To study PQRS of ECG waveforms of normal patient
10) To study Spectrophometer for medical diagnosis
11) To study Colorimeter for medical diagnosis
12) To study Flame photometer for medical diagnosis.

Course Outcome:

- Ability to apply knowledge of anatomy and physiology of cardiovascular system, heart and pacemaker to develop Biomedical Instrumentation

- Ability to design biosensors, amplifiers and recorders to monitor biomedical parameter.

- Ability to select the appropriate components, hardware and software to design Biomedical Instrumentation.

VI Semester B.E. Instrumentation Engineering

Course Code   : **IN607**

Title of the Course   : **Microcontroller and its Applications Laboratory**

Course Scheme				Evaluation Scheme (Laboratory)		
Lecture	Tutorial	Practical	Credits	TW	POE	Total
0	0	3	2	25	25	50

Course Objectives:
- Understand Hardware organization, Instruction Set, Bus structure, peripheral Support devices and Application of 8051 Microcontroller.
- Learn the Assembly Language as well as C language programming for 8051.
- Develop lab experiments based on 8051.
- Understand the use of real-time interrupt structure, programming timer and precise timing Control, Analog to Digital converter, Serial communication and system interface.

Suggested list of experiments: (Using Keil software):-
1. Programs illustrating Data Transfer Operations
2. Programs illustrating Arithmetic Operations
3. Programs illustrating Boolean & Logical Operations
4. Programs illustrating Conditional CALL & RETURN instructions
5. Programs illustrating different code conversions
6. Programs using Timers, Counter, Serial Ports and Interrupts
7. Keyboard interface to 8051
8. Traffic light interface to 8051
9. External ADC and Temperature control interface to 8051
10. Logic controller Interface to 8051
11. Elevator interface to 8051
12. ON/OFF alternate LEDs by sequential keys using PIC microcontroller
13. Display string "Government college of Engineering" on LCD using PIC microcontroller
14. Create the delays with timers & interrupts using PIC microcontroller
15. Read A/D value, convert it to actual & display it on LCD using PIC microcontroller
16. Learn I2C/SSP module using PIC microcontroller
17. Learn UART module using PIC microcontroller

Course Outcome:

- To understand the architecture of 8051 microcontroller and how to write Assembly and high level languages as well as interfacing.

VI Semester B.E. Instrumentation Engineering

Course Code   : **IN608**

Title of the Course   : **Digital Signal Processing Laboratory**

Course Scheme				Evaluation Scheme (Laboratory)		
Lecture	Tutorial	Practical	Credits	TW	POE	Total
0	0	3	2	25	25	50

Course Objectives:
1. To get familiar with the different types of signals and use these various signal to perform operations like convolution.
2. To understand and analyze the practical concepts about different filters through experimentation.
3. To learn and use the proper experimental methods while gathering experimental data.
4. To get familiar with the soft tools like MATLAB and to get familiar with the implementation of filters in MATLAB

List of Experiments:
1. Design and implement FIR filter using windowing method
2. Design & Implement of IIR filter using butter worth approximation.
3. Design & Implement of IIR filter using Chebyshev approximation
4. FIR filters implementation
5. IIR filters implementation
6. Effect of finite word length calculations
7. Practical Based real signal acquisition & analysis
8. Discrete Fourier Transform and Inverse DFT.
9. FFT using DIT and DIF algorithm.
10. IIR filter design using least square method

Course Outcomes:

- Generate various signals from DSP kit and perform convolution of two signals.
- Implement and determine DFT, FFT and IDFT of signals
- Determine the frequency responses of various signals.
- Apply the knowledge of various techniques to design FIR and IIR filters using MATLAB.

VI Semester B.E. Instrumentation Engineering

Course Code : **IN609**

Title of the Course : **Programming Practice IV: LabVIEW**

Course Scheme				Evaluation Scheme (Laboratory)		
Lecture	Tutorial	Practical	Credits	TW	POE	Total
0	0	2	2	25	0	25

Objectives: The purpose of this course is to become familiar the students with graphical programming basics, file input/output, signal generation and processing, data acquisition, and communication protocols used in LabVIEW programming.

Unit	Contents	Hours
1	Basics of LabVIEW: Introduction, LabVIEW and Virtual Instrumentation, Examples, Tools Palette, Controls Palette, Functions Palette, Data Types, Conversion, Parallel Data Flow, Create Indicators/Controls/Constants. Basic Programming: Indicators, Controls, Math Operations, Booleans, Arrays, Strings. Structures: Comparison, Case Structures, Sequences, Local Variables. Loops: For Loops, While Loops, Shift Registers, Indexing. Clusters: Arrays revisited, Matrices, Rings, Clusters, Error Handling, Bundle/Unbundle. Debugging and Sub VI's: Probe, Breakpoint, Stepping, Highlight Execution, Modular Programming	12
2	Advanced Topics: Strings, Booleans, and Data Types. I/O: Reading and Writing to Files, Paths, Data taking, Charting, and Graphing. Timing: Timing function, Timed Loops, Event Structures. Waveforms: Signal Generation/Processing, Waveform types, Dynamic data, Fourier Analysis. Data acquisition (DAQ): Connecting to hardware, DAQ Vi's, Serial, GPIB, and USB interface. Front Panel: Construction, Containers, Decorations, VI Properties, Tabs, Property Nodes. Extra Topics: Sounds Dialog. Other Applications: Embedded combining with LabVIEW, Real-Time, Vision, FPGA, ELVIS etc.	12
	Total	**24**

Term Work (TW):

Term work shall consist of at least ten exercises/programs on programming in LabVIEW software in the form of a journal and necessary documentation. These exercises/programs are based on contents of syllabi given above and shall be used as a guideline for solving problem statements specified within the scope of this laboratory course. Student will also complete a mini project which will be related to their own research agenda.

Outcomes:

At the end of this course students will be expected to have the ability to write high-level LabVIEW programs, such as those used in autonomous controllers or instrument, data acquisition, analysis, scientific research and industry.

TEXT BOOKS:
1. Virtual Instrumentation using LabVIEW by Sanjay Gupta and Joseph John, Tata McGraw-Hill.
2. LabVIEW For Everyone – Graphical Programming Made Easy and Fun by Jeffrey Travis and Jim Kring, Pearson Education India Publisher.

REFERENCE BOOKS:
1. LabVIEW for Engineers by Ronald Larsen, Pearson Education India Publisher.
2. LabVIEW Applications and Solutions by Rahman Jamal and Herbert Pichlik, Prentice Hall.

VI Semester B.E. Instrumentation Engineering

Course Code   **: IN610**

Title of the Course   **: Personal Proficiency**

Course Scheme				Evaluation Scheme (Laboratory)		
Lecture	Tutorial	Practical	Credits	TW	POE	Total
0	0	2	2	25	0	25

Contents
After completing this course the student should get proficiency in 1. Reading, Writing and Speaking Skills: Effective reading: Uses of words, improving the vocabulary, The dictionaries and how to use them, Writing skill: Writing letters at work, Proposal and Report writing practices (R and D, project, patent, etc), writing resume, job application, modes of address, The skill of good speaking: improving your voice and speech, the art of conversation, public speaking, being interviewed by media, job interview, dealing with the boss, dealing with the subordinates, how to run a meeting, negotiating and selling. 2. Effective communication: Introducing oneself, Asking questions, Giving polite replies, complaining and apologizing, persuading people, taking initiative, seeking permission, inviting friends, praising and complimenting people, expressing sympathy, telephonic conversation 3. Body Language: A frame work for understanding, territories and zone, palm gesture, hand and arm gesture, hand-to face gesture, arm barriers, leg barriers, other popular gesture and action, territorial and ownership gesture, body lowering and status pointers, desks tables and seating arrangement, power plays

| 4. Concepts and Practical Approaches for "Self Development": Human Values, Non violent communication, Effective listening and silent communication. Silence and Quiet time |
| 5. Thinking & memorizing skill: How to think, critical thinking and lateral thinking, memorizing skills |

Minimum 10 experiments based on above syllabus or from following suggested list.

1. Vocabulary building (words/week)
2. Learning read/write/speak by listening to learning recourses
3. Report writing
4. Practicing effective communication through play, drama
5. Observation of the conversations
6. Learning body language through presentations and drama
7. Participating in one to one conversation
8. Participating in group conversation
9. Demonstration of Audio, Video CDs of well known personalities
10. Audio & Video recording of the conversations and analyzing it offline
11. Talking in front of mirror in presence of observers like other batch mates, group leaders and/or teachers
12. Diary writing a tool for "Self Development through Self exploration and introspection"
13. Six thinking hats/lateral thinking.
14. Practice of memorizing
15. Case study on Non Violent Communication.
16. Study of Organizational or Corporate structure.

REFERENCES:
1. Communication in English for technical students, by Orient Longman, TTTI Calcutta

2. How to write and speak better, Reader's digest, Touchan Books Limited. Editor John Ellison Kahn
3. Communication skill for technical students, T.M.Farhathullah, Orient Blackswan
4. Communication in English for technical students, TTTI Calcutta , Orient Longman
5. How to write and speak better, Reader's digest, Editor : John Ellison Kahn
6. Body language, Allan Pease, Sheldon press
7. Course Material PPT on, "Self Development Program and Practical approach"
8. Six Hat thinking, by E. D. Bono, Pengwin Book.