

**DEPARTMENT OF INSTRUMENTATION
M. PHIL. / PH.D WRITTEN EXAMINATION SYLLABUS**

PAPER I: RESEARCH METHODOLOGY (GENERAL)

UNIT I: RESEARCH METHODOLOGY ON SCIENTIFIC STUDIES

Importance of R & D activity in Science and Technology. A bird's view of Research and Development activity in the field of instrumentation.

Methodology involved in selecting the Research Topic. Collection of literature from Primary, Secondary and Tertiary sources. Important research journals in the area of instrumentation and their emphasis. Preparation of the review of the earlier literature on Research Topic Selected and Planning of the Research Work.

The basic principles and methods to be adopted in the preparation of Research Paper and M.Phil. /Ph.D. Dissertation.

Ref: 1. Jonathan, Anderson et al.
2. Robert. A day

UNIT – II:

(a) ERRORS, UNCERTAINTIES AND DATA DISTRIBUTIONS

Introduction to Errors and Uncertainties in the measurement. Performance parameters of Instruments. Propagation of Uncertainties in compound quantities.

Properties of Gaussian distribution. Area under the Normal distribution curves. Determination of Mean value and Standard Deviation of the continuous distribution of Gaussian Type. Standardized Normal distribution. Confidence level. Central limit theorem. Significance Test. Chi-Square Test for goodness of fit.

(b) STATISTICAL CONCEPTS AND GRAPHICAL REPRESENTATION

Types of measured quantities. Central tendency of data. Estimates of True Value of Data. Measures of Dispersion of Data (Spread, Variability). Standard deviation of the mean and its evaluation. Coding. Least square of First, Second and higher orders.

Ref: Nakra & Chaudhry

UNIT III: INTERFACING WITH IBM PC / MICROCONTROLLERS

Introduction to computer control. I/O operations with PC. Interfacing D/A converters, A/D converters with IBM PC. Computer based measurements of - Voltage, stepper motor, Frequency, Time, Temperature and their control.

Introduction to Microcontrollers. Microcontroller 8051 – Architecture and instruction set – Addressing modes – Interfacing of LCD display, buffers, latches, EPROMs, RAMs, ADC / DAC Data Converters, and Matrix keyboard with 8051. Applications of Microcontrollers - Temperature controller, Stepper motors- measurement of time period and frequency.

Ref: 1. IBM PC Manual
2. Mazidi

UNIT IV: COMMUNICATION STANDARDS & PROTOCOLS

I/O Buses – ISA, PCI and USB buses – serial and parallel I/O ports – USB port – CAN-LAN-Serial communication – Synchronous and asynchronous communication – RS 232 and RS 485 interfaces – GPIB (IEEE 488) interface – MODBUS – Ethernet. Serial bus standards – I²C bus, SPI bus and ISP bus operation.

Ref: 1. Mazidi & McKinaly

REFERENCE BOOKS:

1. Thesis and Assignment Writings by Jonathan, Anderson, Bairy M. Durkson, Millicent, Pulle.
2. How to write and publish a scientific paper by Robert A. Day, Institute of Scientific Information Press (1979) Philadelphie.
3. Instrumentation measurements and Analysis - By Nakra & Chaudhry
4. Instrumentation devices and systems - By Rangan, Mani, Sharma
5. Microprocessor/Microcomputers: Architecture, Software and systems - By A.J. Khambata.
6. Microprocessor/Microcomputer for Measurement and Control - By Austander, David M. and Paul Sangnes.
7. IBM PC Manual
8. The 8051 Microcontroller Architecture Programming & Applications - By Kenneth J. Ayala
9. 8051 Microcontroller and Embedded systems – by M.A. Mazidi, J.G. Mazidi and R.D. McKinaly.

PAPER II: AREA OF RESEARCH: SCIENTIFIC/ANALYTICAL INSTRUMENTATION

UNIT – I

COMPUTERS AND ANALYTICAL INSTRUMENTS

Hardware over view of Personal computer. Role of personal computers in Analytical instrumentation. Description of DIOT card and Printer ports. Interfacing of analog to digital and digital to analog converters with PC. Serial communication interface. Development of computer based prototype Analytical / Scientific instruments.

UNIT – II

INTRODUCTION TO EMBEDDED SYSTEMS

Hardware and software overview of Embedded systems. Embedded system – on - chip (SOC). Processor and memory organization. Structural units in a processor. Processor selection for an embedded system. Memory devices. Memory selection for an embedded systems. Allocation of memory to program cache and memory management links, segments and blocks and memory map of a system. DMA. Interfacing processors. Memories and input/output devices.

UNIT – III

EMBEDDED SYSTEMS AND ANALYTICAL INSTRUMENTS

ARM 7 Microcontrollers – overview and features. Addressing modes. I/O ports. Instruction set. Interfacing of Keyboard and Display devices - I/O port and memory expansion - Programming concepts for embedded systems. Software programming in assembly language and high-level language C. Keil – C cross compiler. Role of ARM controllers in Analytical / Scientific instrumentation. Development of prototype Analytical / Scientific instruments using Embedded systems.

UNIT – IV

ON-LINE PARAMETER – MEASUREMENT

Web enabled embedded system design. Need for web enabling of embedded systems. Block diagram. Ethernet protocol. TCP/IP protocol architecture. SDMA. Channels and IDMA simulation. TCP/IP protocol stack implementation features. Sensors used for data acquisition. Ethernet. PC web server.

REFERENCEs

1. M.A. Mazidi & J.G. Mazidi, "The 8051 micro controller & Embedded Systems".
2. Embedded system design by Arnold S Burger, CMP.
3. An Embedded software primer by David Simon PEA.
4. Jonathan W. Valvano, Embedded Microcomputer systems. Real Time Interfacing Brookes/ Cole Thomas learning, 1999.

M.Phil

PAPER I: COMPULSORY PAPER

SECTION: I RESEARCH METHODOLOGY AND CRITICAL APPROACHES

SYLLABUS WITH EFFECT FROM 2008-09

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|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| 1. T.S. ELIOT | : Tradition and the Individual Tal |
| 2. Terry Eagleton | : Marxist Literary Criticism |
| 3. Roman Jakobson | : Linguistics and Poetics |
| 4. William G. Moulton | : Linguistics from Aims and Methods of
Scholarship in Modern Languages and
Literatures Ed. James Thorpe |
| 5. Wayne C. Booth | : Telling and Showing |
| 6. Roland Barthes | : Death of Author |
| 7. Wolfgang Iser
Process: A Phenomenological | : The Reading

Approach |
| 8. E.D. Hirsch | : |