MAHATMA GANDHI UNIVERSITY

KOTTAYAM

B.VOC. DEGREE PROGRAMME IN

INDUSTRIAL INSTRUMENTATION AND AUTOMATION

REGULATION, SCHEME AND SYLLABUS

(2018 ADMISSION ONWARDS)

SCHEME AND SYLLABUS FOR

B.VOC. INDUSTRIAL INSTRUMENTATION AND AUTOMATION

(To be introduced from 2018 admissions)

INTRODUCTION

The University Grants Commission (UGC) has launched a scheme on skills development based higher education as part of college/university education, leading to Bachelor of Vocation (B.Voc.) Degree with multiple exits such as Diploma/Advanced Diploma under the NSQF (National skill Qualifications framework). The B.Voc. programme is focused on universities and colleges providing undergraduate studies which would also incorporate specific job roles along with broad based general education. This would enable the graduates completing B.Voc. to make a meaningful participation in accelerating India's economy by gaining appropriate employment, becoming entrepreneurs and creating appropriate knowledge.

OBJECTIVE

- To provide judicious mix of skills relating to a profession and appropriate content of general education.
- To ensure that the students have adequate knowledge and skills, so that they are work ready at each exit point of the programme.
- To provide flexibility to students by means of pre-defined entry and multiple exit points.
- To integrate NSQF within the undergraduate level of higher education in order to enhance employability of the graduates and meet industry requirements. Such graduates apart from meeting the needs of local and national industry are also expected to be equipped to become part of the global workforce.
- To provide vertical mobility to students coming out of:
  - 10+2 with vocational subjects
  - Community Colleges.

DEFINITIONS

B. Voc: Bachelor of Vocation- is a scheme introduced by UGC for skill development based higher education as part of college/university education.
NSQF: National Skills Qualifications Framework
Programme: A Programme refers to the entire course of study and examinations for the award of the B. Voc degree.
Semester: A term consisting of a minimum of 450 contact hours distributed over 90 working days, inclusive of examination days, within 18 five- day academic weeks.
Course: Refers to the conventional paper, which is portion of the subject matter to be covered in a semester. A semester shall contain many such courses from general and skill development areas.
Credit: B. Voc programme follows a credit semester system and each Course has an associated credit.
Grade: Uses seven-point grading system suggested by Hrdayakumari Commission to assess the students.

Words and expressions used and not defined in this regulation shall have the same meaning assigned to them in the Act and Statutes.

The proposed vocational programme in Industrial Instrumentation and Automation will be a judicious mix of skills, professional education related to Industrial Instrumentation and Automation and also appropriate content of general education. It is designed with the objective of equipping the students to cope with the emerging trends and challenges in the field of Industrial Instrumentation and Automation.

ELIGIBILITY FOR ADMISSION AND RESERVATION OF SEATS

The eligibility condition for admission to B.voc programme shall be 10+2 or equivalent, in any stream. Eligibility of admission, Norms for admission, reservation of seats for various B.Voc Programmes shall be according to the rules framed by the University from time to time.

DURATION

The duration of B.Voc Industrial Instrumentation and Automation shall be ***6 Semesters***.

The duration of each semester shall be five months inclusive of the days of examinations. There shall be at least 90 working days in a semester.

A Student may be permitted to complete the Programme, on valid reasons, within a period of 12 continuous semesters from the date of commencement of the first semester of the programme.

The certification levels will lead to Diploma /Advanced Diploma / B.VOC. Degree and will be offered under the aegis of the University as outlined in the Table given below

Award	Duration
B. Voc. Degree in Industrial Instrumentation and Automation	**Six Semesters**
Advanced Diploma	**Four Semesters**
Diploma	**Two Semesters**

ELIGIBILITY FOR HIGHER STUDIES

Those who pass B.Voc. Industrial Instrumentation and Automation Degree are eligible for admission to Master degree in Core and related subjects.

REGISTRATION

The strength of students for each course shall remain as per existing regulations, subject to the marginal increase.

Each student shall register for the courses in the prescribed registration form in consultation with the Faculty Advisor within two weeks from the commencement of each Level of Award. Faculty Adviser shall permit registration on the basis of the preferences of the student and availability of seats.

A student can opt out of a course/courses registered subject to the minimum credits requirement, within seven days from the commencement of the semester.

Those students who possess the required minimum attendance and progress during an academic year/semester and could not register for the annual/semester examination are permitted to apply for Notional Registration to the examinations concerned enabling them to get promoted to the next class.

PROGRAMME STRUCTURE

The B.Voc. Industrial Instrumentation and Automation shall include:

- General Education Components
- Skill Components
- Project
- Internship
- Soft Skills and Personality Development Programmess

COURSE STRUCTURE

NSQF Level	Year	Skill Component Credits	General Component Credits	Exit Points / Awards
Level 7	III	36	24	B. Voc.
Level 6	II	36	24	Advanced Diploma
Level 5	I	36	24	Diploma

As per the UGC guidelines, there are multiple exit points for a candidate admitted in this course. If he/she is completing all the six credits successfully, he/she will get B. Voc. Degree in Industrial Instrumentation and Automation. If he/she is completing the first four semesters successfully, he/she will get an Advanced Diploma in Industrial Instrumentation and Automation. If he/she is completing the first two semesters successfully, he/she will get a Diploma in Industrial Instrumentation and Automation.

EXAMINATIONS

The evaluation of each course shall contain two parts:

(i) Internal or In-Semester Assessment (ISA)
(ii) External or End-Semester Assessment (ESA)

- The internal to external assessment ratio shall be 1:4.
- Both internal and external marks are to be rounded to the next integer.
- All papers (Theory & AOC), grades are given **on a 7-point scale** based on the total

Percentage of marks, ***(ISA+ESA)*** as given below: -

Percentage of Marks	Grade	Grade Point
95 and above	S Outstanding	10
85 to below 95	A^+ Excellent	9
75 to below 85	A Very Good	8
65 to below 75	B^+ Good	7
55 to below 65	B Above Average	6
45 to below 55	C Satisfactory	5
35 to below 45	D Pass	4
Below 35	F Failure	0
	Ab Absent	0

Note: Decimal are to be rounded to the next whole number

CREDIT POINT AND CREDIT POINT AVERAGE

Credit Point (CP) of a course is calculated using the formula

CP = C × GP, where C = Credit; GP = Grade point

Semester Grade Point Average (SGPA) of a Semester is calculated using the formula: -
SGPA = TCP/TC, where TCP is the Total Credit Point of that semester.

Cumulative Grade Point Average (CGPA) is calculated using the formula: -
CGPA = TCP/TC, where TCP is the Total Credit Point of that programme.

Grade Point Average (GPA) of different category of courses viz. Common Course I, Common Course II, Complementary Course I, Complementary Course II, Vocational course, Core Course is calculated using the formula: -

GPA = TCP/TC, where TCP is the Total Credit Point of a category of course.
TC is the total credit of that category of course

Grades for the different courses, semesters and overall programme are given based on the corresponding CPA.

CPA

GPA	Grade
9.5 and above	**S Outstanding**
8.5 to below 9.5	**A+ Excellent**
7.5 to below 8.5	**A Very Good**
6.5 to below 7.5	**B+ Good**
5.5 to below 6.5	**B Above Average**
4.5 to below 5.5	**C Satisfactory**
3.5 to below 4.5	**D Pass**
Below 3.5	**F Failure**

MARKS DISTRIBUTION FOR EXTERNAL AND INTERNAL EVALUATIONS

The external theory examination of all semesters shall be conducted by the University at the end of each semester. Internal evaluation is to be done by continuous assessment. For all courses total marks of external examination is 80 and total marks of internal evaluation is 20. Marks distribution for external and internal assessments and the components for internal evaluation with their marks are shown below:

For all Theory Courses

a) Marks of external Examination : 80

b) Marks of internal evaluation : 20

Components of Internal Evaluation – Theory	Marks
Attendance	5
Assignment /Seminar/Viva	5
Test paper(s) (1 or 2) (1×10 =10; 2×5 =10)	10
Total	20

For all AOC Courses total marks for external evaluation is 80 and total marks for internal evaluation is 20.

For all AOC Courses

a) Marks of external Examination : 80

b) Marks of internal evaluation : 20

Components of Internal Evaluation – AOC	Marks
Attendance	5
Record	5
Skill Test	5
Lab Performance / Punctuality	5
Total	20

*Marks awarded for Record should be related to number of experiments recorded and duly signed by the teacher concerned in charge.

All three components of internal assessments are mandatory.

PROJECT EVALUATION

a) Marks of external Examination : 80
b) Marks of internal evaluation : 20

Components of Internal Evaluation	Marks
Punctuality	5
Experimentation/Data Collection	5
Skill Acquired	5
Report	5
Total	**20**

*Marks for dissertation may include study tour report if proposed in the syllabus.

Components of External Evaluation	Marks
Dissertation (External)	50
Viva-Voce (External)	30
Total	**80**

(Decimals are to be rounded to the next higher whole number)

INTERNSHIP

After the completion of every even semester, the student will undergo a minimum of two weeks Internship Programme in an Industry, having a good exposure in the concerned skill (Established at least two years prior), capable of delivering the skill sets to the students.

At the end of the Internship, the students should prepare a comprehensive report.

Attendance Evaluation for all papers

Attendance Percentage	Marks
Less than 75 %	1 Mark
75 % & less than 80%	2 Marks
80% & less than 85%	3 Marks
85% & less than 90%	4 Marks
90% & above	5 Marks

(Decimals are to be rounded to the next higher whole number)

ASSIGNMENTS

Assignments are to be done from 1st to 4th Semesters. At least one assignment per course per semester should be submitted for evaluation.

INTERNAL ASSESSMENT TEST PAPERS

Two test papers are to be conducted in each semester for each course. The evaluations of all components are to be published and are to be acknowledged by the candidates. All documents of internal assessments are to be kept in the college for one year and shall be made available for verification by the University. The responsibility of evaluating the internal assessment is vested on the teacher(s), who teach the course.

GRIEVANCE REDRESSAL MECHANISM

Internal assessment shall not be used as a tool for personal or other type of vengeance. A student has all rights to know, how the teacher arrived at the marks. In order to address the grievance of students, a three-level Grievance Redressal mechanism is envisaged. A student can approach the upper level only if grievance is not addressed at the lower level.

Level 1: Department Level:

The Department cell chaired by the HOD, Department Coordinator, Faculty Advisor and Teacher in-charge as members.

Level 2: **College level**

A committee with the Principal as Chairman, College Coordinator, HOD of concerned Department and Department Coordinator as members.

Level 3: **University Level**

A Committee constituted by the Vice-Chancellor as Chairman, Pro-Vice-Chancellor, Convener - Syndicate Standing Committee on Students Discipline and Welfare, Chairman-Board of Examinations as members and the Controller of Examination as member-secretary.

The College Council shall nominate a Senior Teacher as coordinator of internal evaluations. This coordinator shall make arrangements for giving awareness of the internal evaluation components to students immediately after commencement of first semester

The internal evaluation marks/grades in the prescribed format should reach the University before the 4th week of October and March in every academic year.

EXTERNAL EXAMINATION

The external examination of all semesters shall be conducted by the University at the end of each semester.

- Students having a minimum of 75% average attendance for all the courses only can register for the examination. Condonation of shortage of attendance to a maximum of 10 days in a semester subject to a maximum of 2 times during the whole period of the programme may be granted by the University on valid grounds. This condonation shall not be counted for internal assessment. Benefit of attendance may be granted to students attending University/College union/Co-curricular activities by treating them as present for the days of absence, on production of participation/attendance certificates, within one week, from competent authorities and endorsed by the Head of the institution. This is limited to a maximum of 10 days per semester and this benefit shall be considered for internal assessment also. Those students who are not eligible even with condonation of shortage of attendance shall repeat the **semester** along with the next batch after obtaining readmission.
- Benefit of attendance may be granted to students attending University/College union/Co-curricular activities by treating them as present for the days of absence, on production of participation/attendance certificates, within one week, from competent authorities and endorsed by the Head of the institution. This is limited to a maximum of 10 days per semester and this benefit shall be considered for internal assessment also.
- Those students who are not eligible even with condonation of shortage of attendance shall repeat the course along with the next batch.
- There will be no supplementary exams. For reappearance/ improvement, the students can appear along with the next batch.
- Student who registers his/her name for the external exam for a semester will be eligible for promotion to the next semester.
- A student who has completed the entire curriculum requirement, but could not register for the Semester examination can register notionally, for getting eligibility for promotion to the next semester.
- A candidate who has not secured minimum marks/credits in internal examinations can re-do the same registering along with the University examination for the same semester, subsequently.

PATTERN OF QUESTIONS

Questions shall be set to assess knowledge acquired, standard and application of knowledge, application of knowledge in new situations, critical evaluation of knowledge and the ability to synthesize knowledge. The question setter shall ensure that questions covering all skills are set. She/he shall also submit a detailed scheme of evaluation along with the question paper. A question paper shall be a judicious mix of short answer type, short essay type /problem solving type and long essay type questions.

Pattern of questions for External examination – Theory paper

Question Type	Total no. of questions	Number of questions to be answered	Marks of each question	Total marks
Very short answer type	12	10	2	20
Short answer (Not to exceed 60 words)	9	6	5	30
Long essay	4	2	15	30
TOTAL	**25**	**18**		**80**

Pattern of questions for external examination – AOC

Question Type	Total no. of questions	Number of questions to be answered	Marks of each question	Total marks
Theory Assessment- Short Answer Type	8	5	4	20
Skill Assessment- Practical	1	1	60	60
TOTAL	**9**	**6**		**80**

Mark division for external AOC/ LAB examination

Record	Theory/ Procedure/ Design	Activity/ Neatness	Result	Viva	Total
10	10	20	10	10	60

RANK CERTIFICATE

The University publishes rank list of top 10 candidates for each programme after the publication of 6th semester results. Rank certificate shall be issued to candidates who secure positions from 1st to 3rd in the rank list. Candidates who secure positions from fourth to tenth in the rank list shall be issued position certificate indicating their position in the rank list.

Candidates shall be ranked in the order of merit based on the CGPA scored by them. Grace marks awarded to the students should not be counted fixing the rank/position. Rank certificate and position certificate shall be signed by the Controller of Examinations.

Mark cum Grade Card

The University shall issue to the students grade/marks card (by online) on completion of each semester, which shall contain the following information:

- Name of University
- Name of the College
- Title & Model of the B. VOC Programme
- Semester concerned
- Name and Register Number of student
- Code, Title, Credits and Max. Marks (Int, Ext & Total)of each course opted in the semester
- Internal marks, External marks, total marks, Grade, Grade point (G) and Credit point in each course in the semester
- Institutional average of the Internal Exam and University Average of the External Exam in each course.
- The total credits, total marks (Max & Awarded) and total credit points in the semester (corrected to two decimal places)
- Semester Credit Point Average (SCPA) and corresponding Grade
- Cumulative Credit Point Average (CCPA)

The final Grade/mark Card issued at the end of the final semester shall contain the details of all courses taken during the entire programme and shall include the final grade/marks scored by the candidate from Ist to 5th semester, and overall grade/marks for the total programme.

READMISSION

Readmission will be allowed as per the prevailing rules and regulations of the university.

There shall **be 3 level monitoring** committees for the successful conduct of the scheme. They are:

1. Department Level Monitoring Committee (DLMC),comprising HOD and two senior-most teachers as members.
2. College Level Monitoring Committee (CLMC),comprising Principal, Dept. – Co-Ordinator and A.O/Superintendent as members.
3. University Level Monitoring Committee (ULMC),headed by the Vice – Chancellor and Pro–Vice – Chancellor ,Convenors of Syndicate subcommittees on Examination, Academic Affairs and Staff and Registrar as members and the Controller of Examinations as member-secretary.

TRANSITORY PROVISION

Notwithstanding anything contained in these regulations, the Vice Chancellor shall, for a period of one year from the date of coming into force of these regulations shall be applied to any programme with such modifications as may be necessary.

PROGRAMME STRUCTURE

Semester – I					
Sl. No.	**Course Code**	**Title**	**GC/SC**	**Hrs./Week**	**Credits**
1	BOCG101	Listening and Speaking Skills in English (T)	GC	4	4
2	BOCG102	IT for Business (AOC)	GC	4	4
3	IIAG103	Discrete Mathematics I (T)	GC	4	4
4	IIAS104	Basics of Electronics and Electrical Technology (AOC)	SC	4	6
5	IIAS105	Basic Instrumentation (AOC)	SC	4	6
6	IIAS106	Project – 1 (domestic circuits)	SC	5	6

Semester – II					
Sl. No.	**Course Code**	**Title**	**GC/SC**	**Hrs./Week**	**Credits**
1	BOCG201	Writing and Presentation Skills in English (T)	GC	4	4
2	IIAG202	Discrete Mathematics II (T)	GC	4	4
3	IIAG203	Electronic Circuits and Communication Systems (AOC)	GC	5	4
4	IIAS204	Analog and Digital Electronics (AOC)	SC	6	6
5	IIAS205	Sensors and Transducers (AOC)	SC	6	6
6	IIAS206	Internship – I (Instrumentation industry)	SC		6

Semester – III					
Sl. No.	**Course Code**	**Title**	**GC/SC**	**Hrs./Week**	**Credits**
1	BOCG301	Principles of Management (T)	GC	4	4
2	IIAG302	Industrial Instruments (T)	GC	4	4
3	IIAG303	Circuit Simulation and PCB Designing (AOC)	GC	4	4
4	IIAS304	Medical Instrumentation (AOC)	SC	4	6
5	IIAS305	Introduction to Microprocessors and Micro Controllers (AOC)	SC	4	6
6	IIAS306	Project – II (Instrumentation)	SC	5	6

Semester – IV					
Sl. No.	**Course Code**	**Title**	**GC/SC**	**Hrs./Week**	**Credits**
1	BOCG401	Soft skill and Personality Development (T)	GC	4	4
2	IIAG402	Valves and Actuators (AOC)	GC	4	4
3	IIAG403	Embedded Automation (AOC)	GC	5	4
4	IIAS404	Virtual Instrumentation (AOC)	SC	6	6
5	IIAS405	Optical Instrumentation (AOC)	SC	6	6
6	IIAS406	Internship–II (Electronic Industry)	SC		6

Semester – V					
Sl. No.	**Course Code**	**Title**	**GC/SC**	**Hrs./Week**	**Credits**
1	BOCG501	Environmental Studies (T)	GC	4	4
2	IIAG502	Industrial Data Communication and Networking (T)	GC	4	4
3	IIAG503	Industrial Safety & Management (AOC)	GC	4	4
4	IIAS504	Robotic Automation (AOC)	SC	4	6
5	IIAS505	Control Theory and Process Control Instrumentation (AOC)	SC	4	6
6	IIAS506	Project – III (Instrumentation and Automation)	SC	5	6

Semester – VI					
Sl. No.	**Course Code**	**Title**	**GC/SC**	**Hrs./Week**	**Credits**
1	BOCG601	Entrepreneurship Development (T)	GC	4	5
2	IIAG602	Distributed Control System (T)	GC	4	5
3	IIAG603	Piping and Instrumentation Diagrams (AOC)	GC	5	5
4	IIAS604	Advanced Embedded Automation (AOC)	SC	6	5
5	IIAS605	Process Control Instrumentation II (AOC)	SC	6	5
6	IIAS606	Internship–III (Instrumentation Industry)	SC		5

GC – General Component
SC – Skill Component

Job Roles

YEAR I (NSQF Level: 5)

1. Operator (Sorting, Soldering, Safety, Testing)
2. Calibration Technician (Mass Balance Volume, Density, Viscosity, Pressure, Vacuum Water Flow)

After completion of first year, students can work as Technician or operator in the field of Electronic, Instrumentation and Automation industry.

YEAR II (NSQF Level: 6)

1. Technician / Supervisor (Valve, Digital Instruments, Medical Instruments, Optical instruments & Fiber optic network)
2. Designer / Supervisor (PCB, Embedded system, Fiber network)

After completion of second year, students can work as Technician or Supervisor in the field of Electronic, optic, Embedded, Instrumentation and Automation industry.

YEAR III (NSQF Level: 7)

1. Engineer / Manager (Instrumentation and Automation, Robotics & Automation, Embedded automation, PLC, DCS, Piping, Plant, Safety

After completion of Third year, students can work as Technician, Supervisor, Engineer or Manager in the field of Electronic, optic, Embedded, Piping, Instrumentation and Automation industry.

B.Voc. Industrial Instrumentation and Automation

Detailed Syllabus

SEMESTER – I

BOCG101 LISTENING AND SPEAKING SKILLS IN ENGLISH

Objectives: *To introduce the students to the speech sounds of English in order to enable them to listen to English and speak with global intelligibility. To enable the students to speak English confidently and effectively in a wide variety of situations. To help the students to improve their reading efficiency by refining their reading strategies.*

MODULE – I

Speech Sounds: Phonemic symbols – Vowels – Consonants – Syllables – Word stress – Stress in polysyllabic words – Stress in words used as different parts of speech – Sentence stress –Weak forms and strong forms – Intonation

Sample activities:

1- *Practice reading aloud. Use a variety of texts including short stories, advertisement matter, brochures, etc.*
2- *Read out a passage and ask the students to identify the stressed and unstressed syllables.*

MODULE – II

Basic Grammar: Articles - Nouns and prepositions - Subject-verb agreement -
Phrasal verbs - Modals - Tenses - Conditionals – Prefixes and suffixes – Prepositions -Adverbs – Relative pronouns - Passives - Conjunctions - Embedded questions - Punctuation –Abbreviations-concord- collocations-phrasal verbs- idiomatic phrases

Sample activities:

1- *Ask students to write a story/report/brochure, paying attention to the grammar.*

MODULE – III

Listening: Active listening – Barriers to listening – Listening and note taking – Listening to announcements – Listening to news on the radio and television.

Sample activities:

1- *Information gap activities (e.g. listen to a song and fill in the blanks in the lyrics given on a sheet)*
2- *Listen to BBC news/ a play (without visuals) and ask the students to report what they heard*.

MODULE– IV

Speaking- Fluency and pace of delivery – Art of small talk – Participating in conversations – Making a short formal speech – Describing people, place, events and things – Group discussion skills, interview skills and telephone skills.

Sample activities:

1- Conduct group discussion on issues on contemporary relevance.

2- Ask students to go around the campus and talk to people in the canteen, labs, other departments etc. and make new acquaintances.

3- Conduct mock interviews in class.

4- Record real telephone conversations between students and ask them to listen to the recordings and make the corrections, if any are required.

MODULE – V

Reading: Theory and Practice – Scanning – Surveying a textbook using an index – reading with a purpose – Making predictions – Understanding text structure – Locating main points – Making inferences – Reading graphics – Reading critically – Reading for research.

Books for Reference:

1- V.Sasikumar, P Kiranmai Dutt and Geetha Rajeevan, Communication *Skills in English*. Cambridge University Press and Mahatma Gandhi University.

2- Marilyn Anderson, Pramod K Nayar and Madhucchandra Sen. *Critical Thinking, Academic Writing and Presentation Skills*. Pearson Education and Mahatma Gandhi University.

For Further Activities

1. Sasikumar, V. Kiranmai Dutt and Geetha Rajeevan, *A Course in Listening and Speaking I & II,* New Delhi: CUP, 2007

2. Tony Lynch *Study Listening: A Course in Listening to Lectures and Note-taking,* New Delhi: CUP,2007.

3. Anderson, Kenneth, Joan *Study Speaking: A Course in Spoken English for Academic Purposes.* New Delhi: CUP, 2008

SEMESTER – I

BOCG102 IT FOR BUSINESS

Objectives: The objective of the course is to help the student understand and appreciate the critical role of Information Systems in today's organizations

MODULE – I

Introduction to Information Technology: Information and Communication Technology (ICT), Information systems E-World - Computer Architecture: Input Hardware - Processing & Memory Hardware, Storage Hardware, Output Hardware, Communication Hardware - Concept of operating system - Understanding your computer customization configuring screen, mouse, printer.

MODULE – II

Word Processing Package: Introduction - Features - Word User Interface Elements; Creating new Documents; Basic Editing, Saving a Document; Printing a Document; Print Preview, Page Orientation - Viewing Documents; Setting tabs - Page Margins; Indents; Ruler, Formatting Techniques; Font Formatting, Paragraph Formatting; Page Setup; Headers & Footers; Bullets and Numbered List; Borders and Shading; Find and Replace; Page Break & Page Numbers; Mail Merging-Spelling and Grammar Checking; Tables; Formatting Tables;

MODULE – III

Spreadsheet Package: Introduction, Excel User Interface, working with cell and cell addresses, selecting a Range, Moving, Cutting, Copying with Paste, Inserting and Deleting cells, freezing cells, Adding, Deleting and Copying Worksheet within a workbook, Renaming a Worksheet. Cell Formatting Options, formatting fonts, Aligning, Wrapping and Rotating text, Using Borders, Boxes and Colors, Centering a heading, Changing row/column height/width, Formatting a Worksheet Automatically, Insert Comments, Clear contents in a cell. Using print Preview, Margin and Orientation, Centering a Worksheet, Using header and footer.

MODULE – IV

Advanced Features of Spreadsheet Package: All Functions in Excel, Using Logical Functions, Statistical functions, Mathematical etc. Elements of Excel Charts, Categories, Create a Chart, Choosing chart type, Edit chart axis - Titles, Labels, Data series and legend, Adding a text box, Rotate text in a chart, Saving a chart.

MODULE –V

Presentation Package: Ms-PowerPoint: Advantages of Presentation Screen layout creating presentation inserting slides adding sounds & videos-formatting slides -slide layout views in presentation -slide transition Custom animation Managing slide shows - using pen Setting slide intervals

Books for Reference:

1. Antony Thomas. *Information Technology for Office*. Pratibha Publications

2. Gini Courter & Annette Marquis. *Ms-Office 2007*: BPB Publications

SEMESTER – I

IIAG103 DISCRETE MATHEMATICS I

Objectives: To explore the fundamental concepts of Mathematics. To understand set theory, relations and functions to read, understand and construct mathematical arguments. To understand recurrence relation, generating functions and algebraic systems.

MODULE – I

Propositional Logic, Propositional Equivalence, Predicates and Quantifiers and Rules of Inference

Chapter 1 (Sections 1.1, 1.2, 1.3 and 1.5only)

MODULE – II

Sets, Set Operations, Functions, Sequences and Summations

Chapter 2 (Sections 2.1, 2.2, 2.3 and 2.4)

MODULE – III

The Integers and Division, Primes and Greatest Common Divisors, Applications of Number Theory.

Chapter 3 (Sections 3.4, 3.5 and 3.7 Only)

MODULE – IV

Relations and Their Properties, Representing Relations, Equivalence Relations, Partial Orderings.

Chapter 7 (Sections 7.1, 7.3, 7.5 and 7.6)

References

1. Clifford Stien, Robert L Drysdale, Kenneth Bogart; *Discrete Mathematics for Computer Scientists*; Pearson Education; Dorling Kindersley India Pvt. Ltd
2. Kenneth A Ross; Charles R.B. Wright; *Discrete Mathematics*; Pearson Education; Dorling Kindersley India Pvt.Ltd
3. Ralph P. Grimaldi, B.V. Ramana; *Discrete And Combinatorial Mathematics* ; Pearson Education; Dorling Kindersley India Pvt. Ltd
4. Richard Johnson baugh; *Discrete Mathematics*; Pearson Education; Dorling Kindersley India Pvt.Ltd
5. Winfried Karl Grassman, Jean-Paul Tremblay; *Logic and Discrete Mathematics A Computer Science Perspective*; Pearson Education; Dorling Kindersley India Pvt. Ltd
6. Kenneth H Rosen; *Discrete Mathematics and Its Applications*; 6th Edition; Tata Mc Graw-Hill Publishing Company Limited

SEMESTER – I

IIAS104 BASICS OF ELECTRONICS AND ELECTRICAL TECHNOLOGY

Objectives: *The course objective is to make students to provide the fundamental knowledge in electronics to enable understanding of its applications. Students should be able to Recognize the component and type of component, material used, construction and the working principle of the component, Test the component, hands-on opportunities to construct electronic circuits and build electronic projects of varying difficulty levels, Practice soldering and de-soldering of various types of electrical and electronic components*

MODULE – I

Basics of Electronics - Definition, applications, modern trends, Electronic Components (active and passive), colour code, Units. Electricity – Electric field, Potential, Potential difference, current, relation between charge and current. Concept of Potential difference. Current and resistance. Ohm's law, effect of temperature on resistance, resistance temperature coefficient, insulation resistance. SI units of work Power and Energy.

MODULE – II

Structure of Solids - Bonding in solids, Energy bands, Insulators, Conductors, Semiconductors. Semiconductors - Semiconductor materials, Intrinsic Semiconductors, Extrinsic Semiconductors. Semiconductor Parameters - Intrinsic concentration, Mobility, Conductivity, Energy gap, Drift and Diffusion Current, N and P type semiconductors. Semiconductor Diodes – PN junction, Junction Theory, VI characteristics - PN junction diode, Ideal diode, Static and Dynamic Resistance, Diode current equation, Diode notations, diode testing, Zener diode- reverse bias characteristics, voltage regulation, shunt voltage regulator, and applications.

MODULE – III

Bipolar Junction Transistors – Types, Construction, biasing, Operation. Common Base configuration-input and output characteristics, Common Emitter configuration- input and output characteristics. Common collector configuration - input and output characteristics, Transistor testing, Transistor casing and terminal. Field Effect Transistors – introduction, Types, Construction and Characteristics of JFET, Transfer Characteristics. Metal Oxide Semiconductor Field Effect Transistors – Depletion Type, Enhancement Type, MOSFET.

MODULE – IV

AC fundamentals - Sinusoidal, square and triangular waveforms-average and effective value form the peak factors DC. Circuits - Kirchhoff's law, ideal and practical voltage and current sources. Mesh and Nodal analysis. Source transformation, Star delta transformation. Superposition theorem, Thevenin's theorem Norton's theorem, maximum power transfer theorem. Magnetic circuit - Concepts, analogy between electric and magnetic circuit, magnetic circuits with DC and AC excitation, self-inductance, mutual-inductance, faradays law hysteresis and eddy current losses, magnetic circuit calculation, mutual coupling.

MODULE – V

Identify different types of soldering iron, soldering different electronic active and passive components and IC, Join the broken PCB track and test, De-soldering using pump and wick, Prepare component for soldering. Setup SMD Soldering station, make a circuit board using

different types of components for a given application, Soldering and de-soldering various SMD ICs of different packages

Texts:

1. S. K. Bhattacharya*, Basic Electrical and Electronics Engineering*, Kindle Edition, Imprint: Pearson Education
2. B. L. Theraja, A. K. Theraja, *Textbook of Electrical Technology*: Basic Electrical Engineering in S. I. Units (Volume - 1) 1st Revised Edition, Publisher: Schan.
3. N N Bhargava, D C Kulshreshtha, S C Gupta, *Basic Electronics and Linear Circuits*, 2e Kindle Edition, Publisher: Tata McGraw-Hill Education.

SEMESTER – I

IIAS105 BASIC INSTRUMENTATION

Objectives: *To understand the basics of instrumentation and measurements classification of instruments, generalized measurement system, learn about the errors in measurements, familiarize with the tools used in the industry, familiarise with electrical analog, digital instruments.*

MODULE I

Basics of Instrumentation- Methods of measurement-direct method, indirect method, mechanical, electrical and electronic instruments. Classification of instruments., Null and deflection methods, functions of instruments and measuring systems, applications of measurement system types of instrumentation systems. Elements of generalized measurement system

MODULE II

Measurement errors, Static characteristics true value static error scale range scale span reproducibility, drift, repeatability, noise, sources of noise, accuracy, precision, limiting errors, known errors Types and sources of errors, error reduction techniques, dynamic characteristics of a measurement system- speed of response, measuring lag, fidelity, dynamic error.

MODULE III

Familiarization with tools handheld tools- measuring tape, hammer, screwdriver, pliers, chisels, hack saw, vice, centre punch, Allen keys, mallet, try square, wrenches, scribers, spanners. Automatic Power tools- power drill, power screwdrivers. (brief explanation of each Tool with figures and application.) Standard of length, end standards, Vernier callipers, inside, depth, and screw gauge height gauges, fixed gauges- gauge block, end bars, slip gauges, surface plates, micrometres. Angular measurements- sine bar, angle gauges, levels, clinometers, taper gauges.

MODULE IV

Electromechanical indicating instruments, Galvanometer (D'Arsonaval), analog Ammeters & Voltmeters, and, watt meters, energy meter (principle, working and construction) Bridge circuits- D.C. bridges – Wheatstone's bridge, Kelvin bridge, A.C. bridges- Wein bridge, Maxwell bridge (principle, working and construction) CRO

MODULE V

Digital Instruments: Block diagram, principle of operation, Accuracy of Measurement Digital Multimeter, Kilowatt Hour meter, Phase meter, Digital Tachometer, Ultrasonic Distance meter, Digital Thermometer DSO, Frequency meter. Digital vs Analog instruments Digital volt meter

Texts:

1. AK Sawhney, *Electrical and Electronic Measurement and instrumentation* , Paperback – 2015, Dhanpath Rai and Company, New Delhi
2. Albert D. Helfrick *Modern electronics Instrumentation and measurement techniques*
3. Umesh Sinha, Satyaprakashan, *Electrical and Electronics measurements and instrumentation*, Tech India publication 1992
4. R.K. Rajput, *Basic mechanical engineering*, Laxmi Publications
5. R.S.Khurmi,J.K.Gupta, *Work shop technology*, S.Chand publishers
6. R.Raman, *Elements of precision engineering*, Oxford & IBH Pubishing New Delhi
7. RK Jain*, Mechanical and Industrial* Paperback 2008
8. Advanced Instrumentation and Control by MF Kureshi

SEMESTER – I

IIAS106 PROJECT - DOMESTIC CIRCUITS

Students must do this project individually. And it should cover important aspects of basic electronics and electrical technology that the student studied during the first of his/ her course.

For this project students should complete an electronic instrumentation circuit. Project should be worked out through various production stages under the guidance and approval of the supervising faculty/faculties. Students have to complete the project within the given time period, and they should keep all the important paper works (abstract, design, working principle, data sheet data collection etc.) along with them.

Students must submit the finished project along with the required paper works and a comprehensive report, to the Head of the Department, before the day of the project evaluation. The project will be evaluated by the external and internal examiners appointed by the university. Delayed, incomplete submissions will be considered as per the university rules.

SEMESTER – II
BOCG201 WRITING AND PRESENTATION SKILLS IN ENGLISH

Objectives: To make the students aware of the fundamental concepts of critical reasoning and to enable them to read and respond critically, drawing conclusions, generalizing, differentiating fact from opinion and creating their own arguments. To assist the students in developing appropriate and impressive writing styles for various contexts. To help students rectify structural imperfections and to edit what they have written. To equip students for making academic presentations effectively and impressively.

MODULE – I

Letter Writing: Letters - letters to the editor - resume and covering letters -parts and layout of business letters-business enquiry letters offers, quotation-orders and execution-grievances and redressal-sales letters-follow-up letters-status enquiry-collection letters-preparation of power of attorney for partnership- job application letters-resume-CV-reference and recommendation letters-employment letters.

MODULE II

Other types of Academic and business Communication(written): Seminar papers- project reports - notices - filling application forms - minutes, agenda-reports-essays.

MODULE – III

Presentation Skills: Soft skills for academic presentations - effective communication skills – structuring the presentation - choosing appropriate medium – flip charts – OHP – Power Point presentation – clarity and brevity - interaction and persuasion.

Compulsory activity: PowerPoint presentations to be conducted by each student in class

MODULE IV

Non-verbal communication-Body language-Kinesics,Proxemics-Para language

Channels-Barriers-Principles of effective communication

MODULE V

Online writing and Netiquette- Writing e-mails- use of language – writing for blogs – social media etiquette- professional networking online (LinkedIn, E-factor etc.)

Compulsory activity: *Each student should create a blog and/or profile in LinkedIn.*

Books for Reference:

1- Marilyn Anderson, Pramod K Nayar and Madhucchandra Sen. *Critical Thinking, Academic Writing and Presentation Skills*. Pearson Education and Mahatma Gandhi University.

2- Antony Thomas, Business, *Communication and MIS*, Pratibha Publications. Bhatia R.C. Business Communication

3- Salini Agarwal, *Essential communication skill*. Reddy P.N, and Apopannia, *Essentials of Business communication*.

4- Sharma R.C KRISHNA Mohan, *Business Communication and Report writing* Leod, M.C. Management Information system

SEMESTER – II
IIAG202 DISCRETE MATHEMATICS II

Objectives: To explore the fundamental concepts of Mathematics. To understand how to apply the knowledge of graph theory to solve real world problems like minimum spanning tree - traversal of binary tree. To understand the concept of matrix and Boolean algebra.

MODULE – I

Graphs and Graph Models, Graph Terminology and Special types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths.
Text 1 Chapter 8 (Sections 8.1, 8.2, 8.3, 8.4 and 8.5 only)

MODULE II

Introduction to Trees, Application of Trees, Tree Traversal, and Spanning Trees.
Text 1 Chapter 9 (Sections 9.1, 9.2, 9.3 and 9.4 only)

MODULE – III

Boolean Function, Representing Boolean Functions and Logic Gates
Text 1 Chapter 10 (Sections 10.1, 10.2 and 10.3 only)

MODULE IV

Definitions and examples of Symmetric, Skew-symmetric, Conjugate, Hermitian, Skewhermitian matrices. Rank of Matrix, Determination of rank by Row Canonical form and Normal form , Linear Equations, Solution of non-homogenous equations using Augmented matrix and by Cramers Rule, Homogenous Equations, Characteristic Equation, Characteristic roots and Characteristic vectors of matix , Cayley Hamilton theorem and applications.
Text 2. Relevant Sections of Chapters 2, 5 , 10 , 19 and 23 (Proofs of all Theorems in Module IV are Excluded)

Text Books:

1. Kenneth H Rosen ; Discrete Mathematics And Its Applications ; 6 th Edition ;Tata Mc Graw-Hill Publishing Company Limited
2. Frank Ayres Jr: Matrices , Schaum's Outline Series , TMH Edition.

Books for Reference:

1. Clifford Stien, Robert L Drysdale, KennethBogart; *Discrete Mathematics for Computer Scientists*; Pearson Education; Dorling Kindersley India Pvt. Ltd
2. Kenneth A Ross; Charles R.B. Wright; *Discrete Mathematics*; Pearson Education; Dorling Kindersley India Pvt.Ltd
3. Ralph P. Grimaldi, B.V.Ramana; *Discrete And Combinatorial Mathematics* ; Pearson Education; Dorling Kindersley India Pvt. Ltd
4. Richard Johnsonbaugh; *Discrete Mathematics*; Pearson Education; Dorling Kindersley India Pvt.Ltd
5. Winfried Karl Grassman, Jean-Paul Tremblay; *Logic and Discrete Mathematics A Computer Science Perspective*; Pearson Education; Dorling Kindersley India Pvt. Ltd

SEMESTER – II

IIAG203 ELECTRONIC CIRCUITS AND COMMUNICATION SYSTEMS

Objective: To learn about biasing of BJTs and MOSFETs Design and construct amplifiers. To understand the advantages and method of analysis of feedback amplifiers. To understand the analysis and design of LC and RC oscillators, amplifiers, multivibrators, and time base generators. To introduce the concepts of various analog modulations and digital modulations.

MODULE – I

Wave shaping and multivibrator circuits - RC & RL Integrator and Differentiator circuits, Storage, Delay and Calculation of Transistor Switching Times, Speed-up Capacitor, Diode clippers, Diode comparator, Clampers. Collector coupled and Emitter coupled Astable multivibrator, Monostable multivibrator, Bistable multivibrators, Triggering methods for Bigtable multivibrators - Schmitt trigger circuit

MODULE – II

Amplifiers and Oscillators - Amplifier- definition, faithful amplification, classification based on configuration, power, and frequency. Transistor CE amplifier with biasing. Working of class, A, B, C, and Push pull amplifier. Two stage RC coupled amplifier working, gain in dB, frequency response. Feedback- definition, types, advantages and disadvantages, applications. Oscillators- definition, classification, LC tank circuit, criteria. RC phase shift and crystal oscillator- working, applications.

MODULE – III

Rectifiers, filters and regulators - Regulated power supply- block diagram and applications. Rectifiers- definition, half wave, centre tapped and bridge full wave rectifier, efficiency, ripple factor, PIV, ratings. Filters- definition, necessity, C and PI filters, Regulator-definition, working of 7805, operating voltages- 7809, 7812, 7905, 7912.

MODULE – IV

Basic blocks of Communication System, noise, AM, Methods of generation and detection. Linear Modulation - DSB-SC, SSB and VSB. Multiplexing.
Angle Modulation - Frequency and Phase modulation. Transmission Bandwidth of FM signals, Methods of generation and detection, FM Stereo Multiplexing, Super heterodyne receiver.

MODULE – V

Base band transmission, Pulse Modulation techniques – PAM, PWM, PPM. Pulse code modulation. Digital modulation techniques – binary ASK, FSK, and PSK. M-array PSK, FSK, QAM, MSK and GMSK. Error probabilities. Multiple access techniques; FDMA, TDMA and CDMA, Introduction to Wireless Communication, Cellular concept, System design fundamentals.

Texts:

1. "Robert L Boylestead and Louis Nashelsky", "*Electronic Devices and circuit theory*", Pearson, Tenth edition 2009
2. "S. Salivahanan, N. Suresh Kumar and A. Vallava Raj", "*Electronic Devices and circuits*", TMH, 2nd Edition 2008.
3. David A. Bell, "*Electronic Devices and Circuits"*, Fifth Edition, Oxford University Press, 2008.
4. Millman J., Halkias C.C., Jit S., "*Electronic Devices and Circuits*", Tata McGraw-Hill, 2nd Edition.
5. John G. Proakis & Masoud Salehi, "*Communication System Engineering*", 2nd Edition, 2002.
6. Kennedy G., Davis B., "*Electronic Communication Systems*", Tata McGraw-Hill, 4th Edition.
7. Sanjay Sharma, "*Communication Systems, Analog & Digital*", S.K. Kataria & Sons, 5th Edition, 2009.

SEMESTER – II

IIAS204 ANALOG AND DIGITAL ELECTRONICS

Objectives: This course will enable the students to understand the basics of construction, working, and applications of various types of electronic components ICs. The aim of the course is to introduce basic concepts of digital circuits and system which leads to design of complex digital system such as microprocessors. Practical exercises of this course would enable students to maintain such circuits and in turn maintain equipment having such circuits.

MODULE – I

OPAMP– definition, block diagram, operation, characteristics, applications, µA 741 pin diagram. Definitions of virtual ground, CMRR and Slew rate. OPAMP applications– inverting, integrator, differentiator, summer, voltage follower, and comparator. Filters- definition, Working- low pass, high pass passive and active filters, applications. Waveform generator-RC Phase shift and Wien-bridge oscillators – Multivibrators– square, triangular and sawtooth wave generator.

MODULE – II

Timers– block diagram, pin diagram of 555, duty cycle, time constant, applications. Multi-vibrators- Astable and monostable using 555, VCO. PLL–principle-block diagram-phase comparator- lock-in range and capture range- PLL applications**.** PWM IC and its application, Basic inverter technology

MODULE – III

Number Systems - Decimal, binary, octal, hexadecimal number system and conversion, binary weighted codes, signed numbers, 1s and 2s complement codes, Binary arithmetic. Boolean Algebra - Binary logic functions, Boolean laws, truth tables, associative and distributive properties, DeMorgans theorem.

MODULE – IV

Combinational Logic - Switching equations, canonical logic forms, sum of product & product of sums, Karnaugh maps, two, three and four variable Karnaugh maps, simplification of expressions. Analysis & design of Combinational Logic - Introduction to combinational circuits, code conversions, decoder, encoder, multiplexers, de multiplexers, binary adder, subtractor, BCD adder, Binary comparator, arithmetic logic units

MODULE – V

Sequential Circuits - flip-flops, RS, JK, Master slave, T, D. Analysis of simple synchronous sequential circuits, counter design. Digital integrated circuits - Logic levels, propagation delay time, fan-out and fan-in, noise margin, logic families

Texts:

1. S. K. Sahdev, *Electronic Devices and Circuits*: (Basic Electronics; EDC; Power Electronics), , Publisher: DHANPAT RAI & CO.(P) LTD-DELHI
2. K R Botkar, *Integrated Circuits*, Publisher: KHANNA PUBLISHSERS-DELHI
3. S. Salivahanan, *Digital Circuits and Design 4/e PB 4th Edition*, Publisher: Schand
4. Millman & Halkias – *Integrated Electronics*, Tata McGraw Hill.

5. Jacob Millman, and C.C. Halkias, "*Electronic devices and circuits*", TMH Publications.
6. H.Taub & D.Shilling, "*Digital Integrated Electronics"*, Mc Graw Hill.
7. Anil K. Maini, *Digital Electronics: "Principles and Integrated Circuits"*

SEMESTER – II

IIAS205 SENSORS AND TRANSDUCERS

Objective: Understand the transducers, sensors and their different classifications different types of transducers with respect to the process variables, introduction to commonly used instruments for each process variables.

MODULE I

Transducers, sensors, classification of transducers primary and secondary transducers, passive and active transducers, analog and digital transducers characteristics and choice of transducers input characteristics, transfer characteristics, transfer function, error, transducer response output characteristics

MODULE II

Temperature Measurement, Thermocouples, RTD, thermistor, semiconductor sensors, Pyrometry, Principles, measuring circuits, characteristics, applications

MODULE III

Pressure measurements, Elastic type, strain gauge, capacitive, inductive piezoelectric type, Measurement of low pressure, McLeod gauge, Thermal conductivity gauges, Ionization gauge, Solid state pressure gauges.

MODULE IV

Flow measurement, Differential pressure type, variable area type, Rotameters, Electromagnetic, Mass flow meters, Turbine type, Anemometer, Ultrasonic type.

MODULE V

Chemical sensors, pH meters, types of electrodes, conductivity meters, cell construction, operation and measurement, Measurement of humidity and moisture content.

Texts:

1. A.K Sawhney, *Electrical and electronic measurements and instrumentation,* 2015
2. G.S.Rangan, G.R.Sharma and V.S.V.Mani, *Instrumentation Devices and Systems*, McGraw Hill, 2006
3. E. O. Deoblin, *Measurement Systems*, Tata McGraw Hill 2006
4. D. Patranabis, *Principles of Industrial Instruemntation*, Tata McGraw Hill 2008
5. B.G Liptak, *Instrumentation and Process Control Handbook*, Vol. I and II, Butterworth-heinemann Ltd, 2005
6. C.D. Johnson, *Process Control Instrumentation Terchnology*, Dorling Kindersley India, 2007

SEMESTER – II
IIAS206 INTERNSHIP – I (INSTRUMENTATION INDUSTRY)

After the completion of the second semester, students will have to undergo two weeks 'internship programme in a reputed electronic industry to understand various aspects in a design production atmosphere.

Students can choose an industry in India or abroad for their internship. College will provide a certificate to prove their identity. A member of the faculty will supervise the student during their internship.

Studios having the following qualities can be chosen:

a. A minimum of two years' after establishment
b. Should be based on domestic electronic equipment manufacturing.

At the end of the internship, students should prepare a comprehensive report. The report of the work done by the student should be attested by the organization. Student should also produce a certificate of internship from the organization. All the above details should be submitted to the Head of the Department for evaluation.

SEMESTER – III
BOCG301 PRINCIPLES OF MANAGEMENT

Objective: This course is a basic introductory and foundational management course. It is designed for students who desire to equip themselves with key knowledge, skills, and competencies in various aspects of management. The course encompasses the core components of management including planning, organizing, leading and controlling the organizations.

MODULE – I

Nature and Process of Management: Schools of Management Thought – Management Process School, Human Behavioural School, Decision Theory School, Systems Management School, Contingency School – Managerial Role – Basics of Global Management.

MODULE – II

Planning: Objectives – Types of plans - single use plan and repeated plan – MBO, MBE– strategic planning and formulation. Decision making - types and process of decision making – forecasting.

MODULE – III

Organizing: Types of organization - formal and informal, line and staff, functional – organization structure and design – span of control, delegation and decentralization of authority and responsibility – organizational culture and group dynamics.

MODULE – IV

Staffing: Systems approach to HRM – Performance appraisal and career strategy – HRD - meaning and concept.

MODULE – V

Directing: Motivation – meaning - need for motivation. Theories of motivation - Herzberg and McGregor. Leadership- importance – styles of leadership, Managerial Grid by Blake and Mounton, Leadership as a Continuum by Tannenbaum and Schmidt, Path Goal Approach by Robert House (in brief) **Controlling -** Concept, Significance, Methods of establishing control.

Books for Reference:

1. Moshal.B.S . *Principles of Management,* Ane Books India,New Delhi.
2. Bhatia R.C. *Business Organization and Management*, Ane Books Pvt. Ltd., NewDelhi.
3. Richard Pettinger. *Introduction to Management*, Palgrave Macmillan, New York.
4. Koontz and O'Donnel. *Principles of Management, Tata* McGraw-Hill Publishing Co.Ltd. New Delhi.
5. Terry G.R. *Principles of Management,* D.B.Taraporevala Sons & Co.Pvt.Ltd., Mumbai.
6. Govindarajan.M and Natarajan S. *Principles of Management*, PHI, New Delhi.
7. Meenakshi Gupta . *Principles of Management*, PHI, New Delhi.

SEMESTER – III
IIAG302 INDUSTRIAL INSTRUMENTS

Objective: To understand the instruments and their different classifications with respect to the process variables, introduction to commonly used instruments for each process variable.

MODULE – I

Level Measurement: Capacitance probe; conductivity probes; diaphragm level detector, differential pressure level detector, radiation level sensors, RADAR level gauges, level transmitter, ultrasonic level detector.

MODULE – II

Vacuum measurement and applications Vacuum measuring instruments- thermal conductivity gauges, ionization gauges, pirani gauge, Mcleod gauge (principle, construction and working, advantages and disadvantages) Pumps- rotary pumps, root blowers (principle, construction and working, advantages and disadvantages).

MODULE – III

pH - Definition, types of electrodes, glass electrode pH measurement, application in Chemical industries (principle, construction and working, advantages, disadvantages)

MODULE – IV

Smart sensors - Block diagram- Smart transmitter., Recent trends in sensor technology, Semiconductor sensors, Film sensors, MEMS, Nanosensors (principle, construction and working, advantages, disadvantages)

MODULE – V

Detectors - Smoke detectors, LPG detectors, Chlorine detectors, SPM, Dissolved oxygen meters, CO analyzers (principle, construction and working)

Texts:

1. Gregory K. McMillan, Douglas M. Considine, *Process/Industrial Instruments and Controls Handbook*, Mc Graw Hill
2. A. K. Sawhney, *A Course in Electrical and electronics Measurements and Instrumentation*, Puneet Sawhney,Dhanpat Rai & Co.
3. A.K. Sawhney, *A Course in Mechanical Measurements and Instrumentation & Control,* Puneet Sawhney, Dhanpat Rai & Co.
4. S.K.Singh, Industrial Instrumentation and control, Mc Graw Hill
5. Ernest O Doebelin, *Measurement Systems: Application and Designs*, Mc Graw Hill

SEMESTER – III
IIAG303 CIRCUIT SIMULATION AND PCB DESIGNING

Objective: This course is to enable students for designing PCB using software. PCB (Printed Circuit Board) designing is an integral part of each electronics products and this program is designed to make students capable to design their own projects PCB up to industrial grade.

MODULE – I

Introduction & Brief History - What is PCB, Difference between PWB and PCB, Types of PCBs - Single Sided (Single Layer), Multi-Layer (Double Layer), PCB Materials, Introduction, Schematic Design with Capture, Circuit Simulation using P-Spice, Introduction, Description of P-Spice, Types of analysis, Description of simulation software tools (like OrCAD / PROTEL / Proteus / Microcap / Eagle)

MODULE – II

Component Package Types - Through Hole Packages - Axial lead, Radial Lead, Single Inline Package (SIP), Dual Inline Package (DIP), Transistor Outline (TO), Pin Grid Array (PGA), Through Hole Packages - Metal Electrode Face (MELF), Leadless Chip Carrier (LCC), Small Outline Integrated Circuit (SOIC), Quad Flat Pack (QPF) and Thin QFP (TQFP), Ball Grid Array (BGA), Plastic Leaded Chip Carrier (PLCC)

MODULE – III

PCB Layers - Electrical Layers, Top Layer, Mid Layer, Bottom Layer, Mechanical Layers, Board Outlines and Cut-outs, Drill Details, Documentation Layers, Components Outlines, Reference Designation, Text, PCB Materials - Standard FR-4 Epoxy Glass, Multifunctional FR-4, Tetra Functional FR-4, NelcoN400-6, GETEK, BT Epoxy Glass, Cyanate Aster, Polyimide Glass, Teflon

MODULE – IV

Introduction to Development Tools, PCB Designing Flow Chart - Schematic Entry, Net listing PCB Layout Designing, Prototype Designing, Design Rule Check (DRC), Design for Manufacturing (DFM), Rules for Track - Track Length, Track Angle, Rack Joints, Track Size, Schematic Entry, Creating Library & Components, Drawing a Schematic, Auto routing

MODULE – V

Printing the Design, Etching, Drilling, Interconnecting and Packaging electronic Circuits (IPC) Standards, Gerber Generation, Soldering and De-soldering, Component Mounting, PCB and Hardware Testing

Texts:

1. User manuals of PROTEL, PROTEUS, OrCAD, Microcap, Eagle
2. Walter C. Bosshart, Printed circuit Board Design and technology.
3. R. S. Khandpur, *Printed circuit board design, fabrication assembly and testing*, Tata Mc Graw Hill 2005.

4. Mark I Montrose, *EMC and Printed circuit board, Design theory and layout*, IEEE compatibility society
5. Robert torzwell, *Flexible Printed circuit board Design and manufacturing*, Published By: D.B.Management Group L.L.C.
6. Clyde F. Coombs, Jr., *Printed Circuits Handbook*, Sixth Edition.
7. Christopher T. Robertson, *Printed Circuit Board Designer's Reference: Basics*, Prentice Hall Professional, 2004
8. M. H. Rashid '*Introduction to P-spice using OrCAD for circuits and Electronics*' –Pearson Education

SEMESTER – III
IIAS304 MEDICAL INSTRUMENTATION

Objective: This subject will enable the students to learn the basic principles of different instruments/equipment used in the health care industry. To understand the physical foundations of biological systems, various electrodes and detailed understanding about the various electro physiological measurements in the human body.

MODULE – I

Origin of bioelectric potentials – resting and action potentials -propagation of action potentials – Examples of bioelectric potentials - ECG, EEG, EMG– Electrodes for measurement of biopotential Transducers for measurement of temperature, pressure & displacement - Basic principles only

MODULE – II

Electrical activity of heart, electrocardiogram - lead systems - ECG machine – block diagram Cardiac pacemakers – internal and external pacemakers, defibrillators – basic principles. Measurement of heart sounds – phonocardiography

MODULE – III

Measurement of blood pressure – sphygmomanometer & oscillometric methods. Photo plethysmography - for pulse rate measurement - Pulse oximeters Holter recorders. Cardiac stress testing – methods & protocols Patient monitoring systems-Bed side & central station

MODULE – IV

Electrical activity of brain - Electro encephalogram – EEG measurement & waveforms - block diagram. Evoked potential - types & applications Electrical activity of Muscle – Electromyogram (EMG) – Types of electrodes. Spiro meter - measurement of respiratory parameters

MODULE – V

Ultrasonic imaging – Basic principles - Ultrasonic transducers & Types - modes of image display-Principles & applications. Doppler & colour flow imaging MRI – Basic Principles - FID signal-excitation & emission – Basic pulse sequences - Block diagram

Texts:

1. Joseph J. Carr, John M. Brown, *Introduction to Biomedical Equipment Technology*, Pearson Education (Singapore) Pvt. Ltd., 2001.
2. Bronzino, *Hand book of Biomedical Engineering*, IEEE press book.
3. Geddes& Baker, *'Principles of Applied Biomedical Instrumentation'*, Wiley
4. John G Webster (Ed), *Encyclopedia of Medical Devices and Instrumentation* ,Wiley
5. R.S Khandpur, *Handbook of Biomedical Instrumentation,* Tata McGraw
6. Webster J, *'Medical Instrumentation-Application and Design'*, John Wiley

SEMESTER – III

IIAS305 INTRODUCTION TO MICROPROCESSORS AND CONTROLLERS

Objective: This course is to expose to the students to the architecture and instruction set of typical 8-bit microprocessor and 16-bit microprocessor. It also deals with Assembly Language Programming using a macro-assembler. This course also provides an introduction to microcontrollers and interfacing. Architecture operation and applications of microcontrollers, including system level organization, analysis of specific processors, and software and hardware interface design. To introduce the basic concepts of embedded c.

MODULE – I

Introduction to Microprocessor, 8085 Microprocessor Architecture, Address, Data and Control Buses, 8085 Pin Functions, Demultiplexing of Buses, Generation Of Control Signals, Instruction Cycle, Machine Cycles, T-States, Memory Interfacing, Classification of Instructions, Addressing Modes, 8085 Instruction Set, simple programs ang simulations, Peripheral IC- 8255, 8279, 8253, 8257

MODULE – II

Introduction to Microcontrollers and Embedded Processors, 8051 Microcontrollers Hardware - Microcontroller Architecture - IO Port structure, memory organization, Special Function Registers (SFRs). Instruction Set, addressing modes, Instruction Types, Serial Communication.

MODULE – III

Introduction to C, Variables and identifiers, built-in data types. Variable definition, Arithmetic operators and expressions, constants and literals, Statement, basic input/output statement, simple 'c' programs, conditions, relational operators, logical connectives, if statement, if-else statement, loops - while loop, do while, for loop. Nested loops, infinite loops, switch statement, structured programming, Arrays, Functions and pointers.

MODULE – IV

Introduction to KEIL, Arithmetic operations and Programs, Logical operations and Programs, Jump and Call instructions and Programs, I /O Pot Programs, Single bit instructions and Programs, Timer and counter Programs

MODULE – V

Introduction to Embedded C, Introduction to KEIL-C51, Interfacing programs - Key Board, 7segment displays, Pulse Measurement, D / A and A/D conversion, Stepper Motor, LCD interfacing, PIR, HCSR04.

Text Book

1. 8051 user manuals
2. 8085 user manuals

3. Muhammed Ali Mazidi, *The 8051 Microcontrollers and Embedded Systems.*
4. Kenneth J. Ayala, *The 8051 Microcontrollers Architecture, Programming & Applications*
5. Ramesh Gaonkar, *Microprocessor Architecture, Programming, and application with 8085*, Penram International Publication, 2011.
6. Ram, *Fundamentals of microprocessors and microcomputers,* Dhanpat Rai Publications, New Delhi

SEMESTER – III

IIAS306 PROJECT II– INSTRUMENTATION

Students must do this project individually. And it should cover important aspects of micro controllers that the student studied during the second semester of his/ her course.

For this project students should complete an electronic instrumentation circuit. Project should be worked out through various production stages under the guidance and approval of the supervising faculty/faculties. Students have to complete the project within the given time period, and they should keep all the important paper works (abstract, design, working principle, data sheet data collection etc.) along with them.

Students must submit the finished project along with the required paper works and a comprehensive report, to the Head of the Department, before the day of the project evaluation. The project will be evaluated by the external and internal examiners appointed by the university. Delayed, incomplete submissions will be considered as per the university rules.

SEMESTER – IV
BOCG401 SOFT SKILL AND PERSONALITY DEVELOPMENT

Objective: The course aims to cause a basic awareness about the significance of soft skills in professional and inter-personal communications and facilitate an all-round development of personality.

MODULE – I

Personal Skills: Knowing oneself- confidence building- defining strengths- thinking creatively- personal values-time and stress management.

MODULE – II

Social Skills: Appropriate and contextual use of language- non-verbal communication- interpersonal skills- problem solving.

MODULE – III

Personality Development: Personal grooming and business etiquettes, corporate etiquette, social etiquette and telephone etiquette, role play and body language.

MODULE – IV

Presentation skills: Group discussion- mock Group Discussion using video recording - public speaking.

MODULE – V

Professional skills: Organizational skills- team work- business and technical correspondence-job oriented skills-professional etiquettes.

Books for Reference:

1. Matila Treece: *Successful communication*: Allyun and Bacon Pubharkat.
2. Jon Lisa, *Interatid skills in Tourist Travel Industry,* Longman Group Ltd.
3. Robert T. Reilly, *Effective communication in tourist travel Industry* Dilnas Publication.
4. Boves. *Thill Business Communication Today* Mcycans Hills Publication.
5. Dark Studying International Communication Sage Publication.
6. Murphy Hidderandt Thomas *Effective Business Communication* Mc Graw Hill.

SEMESTER – IV
IIAG402 VALVES AND ACTUATORS

Objective: To understand working of a control valve by learning about different parts of the control valve, and to study different types of valve and its maintenance and assembly. To study about actuators and their types and its maintenance and working.

MODULE – I

Valve-Parts of valve- Body, Bonnet, ports, handle, actuator, disc stem, gasket, spring, Trim, spring

MODULE – II

Various types of valves Gate, expanding gate, plug, ball, check, double block and bleed, Butterfly valve, Globe valve, Disk check valve

MODULE – III

Introduction to actuators,Basic actuators and actuator operation, Sizing actuators (overview), Basic mechanical operation, Control components and configurations, Maintaining actuators safely

MODULE – IV

Valve disassembly, assembly, Two port valves, Three port valves,four port Valves.

MODULE – V

Valve maintenance, Valve types and functioning, Field lubricants, Maintenance, Packing, Sealants

Texts: -

1. Bela G Liptak, *Flow Measurement*
2. Bela G Liptak, *Instrument Engineers Handbook.*
3. Philip L. Skousen, *Valve Handbook* 3rd Edition

SEMESTER – IV

IIAG403 EMBEDDED AUTOMATION

Objective: The objective of this course is to teach students design and interfacing of microcontroller-based embedded systems. High-level languages are used to interface the microcontrollers to various applications. There are extensive hands-on labs/projects. Embedded system for sensor applications will be introduced.

MODULE – I

Introduction to PIC micro controllers -Advantage of PIC micro controllers – Types and products of PIC, Architecture.

MODULE – II

Introduction of AVR Architecture, Pipelining, Digital Basics, Pin configuration of ATMEGA16, Register structure of ATMEGA16,32,128, AVR Compiler IO Registers in ATMEGA16, 32, 128, Introduction to AT Tiny and AT Micro series

MODULE – III

Different peripheral device -Difference types of display units -7 Segments & its types -Principle of Operation-Common Anode mode-Common Cathode mode -16x2 LCD - Applications-Hardware interfaces-Interfacing Circuits for LCD & LED -Pin diagram of 16x2- working mechanism LCD using Arrays & Pointers. Programming for ADC& ADC application-Temperature sensor interfacing with controller.

MODULE – IV

Definition for Interrupt -Interrupt types -Handling interrupts, Serial Communication -Hardware Description-Logical Level Converter-MAX 232 -design-Serial Port-Programming for serial communication-Implementation with Real time application. I2C Protocol – Programming for I2C Protocol-Real time application using RTC, Advantages & Disadvantages of I2C Protocols

MODULE – V

Various Sensor Devices interfacing theory Sensor interfacing with microcontroller & circuit Sensor Controlling programs Bluetooth interfacing program Zigbee interfacing program GSM interfacing program

Texts:

1. Muhammad Ali Mazidi, Rolin D. McKinlay, and Danny Causey, "*The PIC Microcontroller and Embedded systems – Using Assembly and C for PIC18*", Prentice Hall, 2007
2. Design reference notes and data sheets of Microchips.
3. John Petman, *Design with PIC Microcontroller*
4. Muhammed Ali Mazeedi. *AVR Microcontroller and Embedded Systems,* Pearson Education Ltd.
5. By Dhananjay Gadre, *Programming and Customizing the AVR Microcontroller*
6. AVR ATmega32 data sheet
7. PIC Manuals

SEMESTER – IV
IIAS404 VIRTUAL INSTRUMENTATION

Objective: Define virtual instrumentation concepts. Describe acquisition methodologies. Compare traditional and virtual instrumentation. Discuss operating systems required for virtual instrumentation. This course gives an idea of general structure of SCADA system, functional elements, data links, software and algorithms, communication and control aspects of modern plant automation system.

MODULE – I

Virtual Instrumentation - Definition and Flexibility - Block diagram and Architecture for Virtual Instruments versus Traditional Instruments Instrumentation -VI Programming techniques - VI, sub VI, Loop and Charts, Arrays, Clusters and Graphs, Case and Sequence Structures, Formula nodes, String and File Input / Output

MODULE – II

Data Acquisition (DAQ) Fundamentals

PC-Based DAQ System: PC, transducers and signal conditioners, DAQ hardware, Data acquisition specifications: Analog input: sampling rate, multiplexing, resolution, relative accuracy, noise, Analog output, Triggers, Real-Time system integration, Digital I/O. Timing I/O, Software, Multichannel analog DAQ system, Set up for data acquisition universal DAQ card, Use of timer-counter and analog outputs on the universal DAQ card

MODULE – III

Application Development Software (LabVIEW)

LabVIEW application development for virtual instrumentation (VI) 3.2 Creating a virtual instrument in LabVIEW 3.3 Dataflow programming concepts 3.4 Sub VIs and modular code creation 3.5 Arrays and File I/O 3.6 Textual Math Integration with LabVIEW 3.7 Interfacing external instruments to a PC.

MODULE – IV

Graphical Programming Environment in Virtual Instrumentation

Data formulation Wave form graph Trigonometric waves Wave form charts Acquiring data and its graphical representation, File formats Simulating a DAQ device Using counter and digital I/O Measuring Analog input Generating analog output

MODULE – V

SCADA software

SCADA Overview Basics of SCADA, SCADA key features, remote Terminal Units (RTU), PLC used as RTU, DCS versus SCADA terminology, SCADA software packages, Application examples of SCADA. Script Programming, Real Time and Historical Trend, Configuring Alarms, Real Time Project Development with PLC Interfacing, Communication with other Software, Recipe Management, Accessing Different Security Levels, Report Generation of Current Plant,
Recipe management, Communication with Excel, Communication with PLC
Text books

1. S. Gupta and J.P Gupta, *'PC Interfacing for Data Acquisition and Process Control'*, Instrument society of America, 1994.
2. Peter W. Gofton, *'Understanding Serial Communications'*, Sybex International.
3. Robert H. Bishop, *'Learning with Lab-view'*, Prentice Hall, 2003.
4. Kevin James, *'PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control'*, Newness, 2000.
5. Gary W. Johnson, Richard Jennings, *'Lab-view Graphical Programming'*, McGraw Hill Professional Publishing, 2001.
6. Wonderware InTouch manual

SEMESTER – IV
IIAS405 OPTICAL INSTRUMENTATION

Objective: Introduction to the concepts of optical instruments and transducers. To impart knowledge about lasers and their applications. This course This course will start with the basic conceptual foundations and then will be developed to cover various technological and application aspects of the fiber optics including the recent and emerging technologies in fiber optics. Each topic will be developed in logical progression with up-to-date information.

MODULE – I

Nature of light, electromagnetic optics spectrum, propagation of light, electromagnetic waves in dielectric media, polarization and coherence, interactions of light with matter, absorption, scattering, dispersion, polarization, diffraction and interference. Electromagnetic spectrum,

MODULE – II

Light sources, natural sources, incandescent lamp, gas discharge lamp. Light-emitting diodes-electro luminescent process, LED structures, infrared sources, semiconductor laser, absorption, spontaneous emission and stimulated emission, line broadening, rate equations for lasers with optical pumping,

MODULE – III

Optoelectronic detectors and Transducers: Thermal detectors and Quantum detectors, LDR photoelectric transducers, photo multipliers, photo voltaic, photo conductive, photo diode and photo transistors. Encoders, Classification and construction, Brush type optical displacement transducers, shaft encoder codes and decoding, optical encoders- photo optic transducers, IR detectors, Solar cells, CCD devices.

MODULE – IV

Fundamental of Fibers, Fiber Optic Communication system, Wave guiding principles, dielectric waveguide, total internal reflection, acceptance angle, single mode fibers, types and classification of fibers, Attenuation, Material absorption losses, scattering losses, bending losses, intramodal and intermodal losses.

MODULE – V

Source-to-fibre power launching, power launching calculation, lensing schemes for coupling improvement, Multimode passive and active fiber sensors, phase-modulated sensors,

fusion splicing, mechanical splicing, Time domain Reflectometer (OTDR), Time domain dispersion measurement, Frequency Domain dispersion measurement,

Texts:

1. J. Wilson & J. F. B. Hawkes, "*Optoelectronics: An Introduction*" PHI/ Pearson
2. Rajpal S. Sirohi "*Wave Optics and its Application*", Hyderabad, Orient longman Ltd.
3. John M. Senior, "*Optical Fiber Communications"*, Prentice Hall of India,3rd edition
4. Harold Kolimbiris, '*Fiber Optics Communications*', Pearson Education, 2004.
5. John M. Senior, Optical Fiber Communication, (PHI/Pearson)
6. Djafar Mymbaev & Lowell L, *Fiber optical communication Technology*, Scheiner. (Pearson edition)
7. Gerd Keiser, *Optical Fiber Communications*, 2ndEdn., McGraw Hill, Inc.

SEMESTER – IV

IIAS406 INTERNSHIP – II (ELECTRONIC INDUSTRY)

After the completion of the fourth semester, students will have to undergo two weeks 'internship programme in a reputed instrumentation industry to understand various aspects in a design production atmosphere.
Students can choose an industry in India or abroad for their internship. College will provide a certificate to prove their identity. A member of the faculty will supervise the student during their internship.
Studios having the following qualities can be chosen:

a. A minimum of two years' after establishment
b. Should be based on domestic electronic equipment manufacturing.

At the end of the internship, students should prepare a comprehensive report. The report of the work done by the student should be attested by the organization. Student should also produce a certificate of internship from the organization. All the above details should be submitted to the Head of the Department for evaluation.

SEMESTER – V

BOCG501 INDUSTRIAL DATA COMMUNICATION AND NETWORKING

Objective: To create a pro-environmental attitude and a behavioral pattern in society that is based on creating sustainable lifestyles. To acquire knowledge of pollution and environmental degradation.

MODULE – I

Multidisciplinary nature of environmental studies Definition, scope and importance-Need for public awareness. Natural Resources : Renewable and non-renewable resources :

Natural resources and associated problems. Forest resources : Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies. Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies. Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

MODULE – II

Ecosystems 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, characteristic features, structure and function of the following ecosystem : Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and its conservation Introduction – Definition : genetic, species and ecosystem diversity, Biogeographically classification of India, Value of biodiversity : consumptive use, productive 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 to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts., Endangered and endemic species of India, Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity.

MODULE – III

Environmental Pollution Definition ,Cause, effects and control measures of :- Air pollution-Water pollution-Soil pollution Marine pollution-Noise pollution-Thermal pollution-Nuclear hazards Solid waste Management : Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution, Pollution case studies, Disaster management : floods, earthquake, cyclone and landslides. Human Population and the Environment Population growth,

variation among nations-Population explosion – Family Welfare Programme- Environment and human health-Human Rights-Value Education-HIV/AIDS-Women and Child Welfare- Role of Information Technology in Environment and human health-Case Studies.

MODULE – IV

Social Issues and the Environment From Unsustainable to Sustainable development-Urban problems related to energy-Water conservation, rain water harvesting, watershed management-Resettlement and rehabilitation of people; its problems and concerns-Case Studies

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-Air (Prevention and Control of Pollution) Act-Water (Prevention and control of Pollution) Act-Wildlife Protection Act-Forest Conservation Act-Issues involved in enforcement of environmental legislation-Public awareness

Text:

1. Textbook for Environmental Studies For Undergraduate Courses of all Branches of Higher Education Erach Bharucha for University Grants Commission

Further activities:

1. Field work
2. Visit to a local area to document environmental assets river/forest/grassland/hill/mountain
3. Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
4. Study of common plants, insects, birds.
5. Study of simple ecosystems-pond, river, hill slopes, etc. (Field work Equal to 5 lecture hours)

SEMESTER – V

IIAG502 INDUSTRIAL DATA COMMUNICATION AND NETWORKING

Objective: Students will be able to test, build, wire and troubleshoot the different types of industrial data communication circuits used for instrumentation like FieldBUS, ProfiBUS network for automation. This this course is very important for instrumentation engineers who want to work in industrial automation sector.

MODULE – I

Local Area Network
Computer networks in instrumentation, components of computer networks- hardware and software, network topologies star, ring, bus, mesh. Network classification based on transmission technologies- point to point, broadcast - based on scale - LAN, WAN, MAN, VPN, internet. based on architecture- peer-to-peer, client server, advantages of client server over peer-to-peer model

MODULE – II

Network devices and communication protocol
basics of protocol and its need, brief functional description of each the OSI- ISO reference model layers with list of protocols. The TCP / IP reference model:brief functional description of each of the layer with list of protocols IP layer protocols ipv4 and IPv6 frame formats internet addressing, network addressing, subnets and subnet masking, gateway dressing, broadcast addressing, dotted decimal notation, loopback addressing. Domain name system DNS introduction, mapping to IP address

MODULE – III

Network media and hardware
Transmission Media:unguided and guided media, wired and wireless, UTP, coaxial and fibre optical cable. types of Connectors: RJ-45, RJ-11,BNC, BNC–T, BNC Terminator, Fiber optic connectors:-Subscriber Channel(SC), Straight Tip(ST),Mechanical transfer–registered jack(MT-RJ) connectors Network Interface Card (NIC),ARCNET, Ethernet. Network con necting devices: Repeater, Hub, Bridge, Switch , Router, Gateway, Access point, Wireless Access points. Servers introduction : File, Print, Mail,Proxy, Web

MODULE – IV

Basics of fieldbus and profibus
Introduction to Foundation fieldbus physical layer and wiring rules, data link layer, application layer, user layer. Wiring and installation practice with fieldbus termination and preparation, installation of the complete system, troubleshooting of foundation fieldbus, introduction to physical problem, power problem, communication problem, test equipment for foundation fieldbus. Introduction to profibus standard profibus protocol stack physical layer data link layer application layer troubleshooting of profibus.

MODULE – V

HART and MODBUS

Concept off highway addressable remote transducer (HART), HART and smart instrumentation, HART protocol, HART physical layer, HART data link layer, HART benefits, troubleshooting of HART. Overview of modbus protocol, modbus protocol structure. Function quotes- read coil or digital output status (function code 01) ,read digital input status(function code 02), read holding registers (function code 03)

Text:

6. Tannebaum AndrewS Wetherall David J., *Computer networks* Pearson, New Delhi 5th Edition 2011
7. Stallings Williams, *Data and computer communications*, PHI Learning, New Delhi, Last Edition
8. Trivedi Bhushan, *Computer networks*, Oxford University Press,New Delhi 2013
9. Forouzen, *Data communication and networking,* - Tata McGraw Hill, Education New Delhi (Latest edition)
10. Steve Mackay Edwin Wright, Deon Reynders, John Park, *Practical industrial data networks*, design, installation and troubleshooting, Newnes An imprint of Elsevier
11. Sharma Sanjay, *Data communication networks* S.K.Kataria and Sons, New Delhi (Latest edition)

SEMESTER – V

IIAG503 INDUSTRIAL SAFETY & MANAGEMENT

Objectives: *1. To generate safety awareness among students. 2. To help the students learn the fundamentals of science and engineering of safety. 3. To help the students acquire attitude towards safety.*

MODULE 1

Introduction: Evolution of modern safety concept- Safety policy - Safety Organization - line and staff functions for safety- Safety Committee- budgeting for safety.

Techniques: Incident Recall Technique (IRT), disaster control, Job Safety Analysis (JSA), safety survey, safety inspection, safety sampling, Safety Audit.

MODULE 2

Accident investigation: Concept of an accident, reportable and non reportable accidents, unsafe act and condition – principles of accident prevention, Supervisory role- Role of safety committee - Accident causation models.

MODULE 3

Accident reporting: Overall accident investigation process - Response to accidents, Accident reporting requirement, planning document, Planning matrix, Investigators Kit, functions of investigator, four types of evidences, Records of accidents, accident reports- Class exercise with case study.

MODULE 4

Safety performance monitoring: Permanent total disabilities, permanent partial disabilities, temporary total disabilities - Calculation of accident indices, frequency rate, severity rate, frequency severity incidence, incident rate, accident rate, safety "t" score, safety activity rate – problems.

MODULE 5

Safety education and training: Importance of training-identification of training needs- training methods – programme, seminars, conferences, competitions – method of promoting safe practice - motivation – communication - role of government agencies and private consulting agencies in safety training – creating awareness, awards, celebrations, safety posters, safety displays, safety pledge, safety incentive scheme, safety campaign – Domestic Safety and Training.

References:

1. Accident Prevention Manual for Industrial Operations, N.S.C.Chicago, 1982
2. Heinrich H.W., *Industrial Accident Prevention*, McGraw-Hill Company, New York, 1980.
3. Krishnan N.V., *Safety Management in Industry*, Jaico Publishing House, Bombay,1997

SEMESTER – V
IIAS504 ROBOTIC AUTOMATION

Objective: To introduce the functional elements of Robotics. This course will provide knowledge on the direct and inverse kinematics motion and control path planning techniques dynamics and control of manipulators This course is designed to introduce and familiarize students with programming using the Arduino Micro-controller and controlling robots using Arduino.

MODULE – I

Basic concepts, power sources and sensors – Definition and origin of robotics, Different types of robots, degree of freedom Asimov's laws of robotics, different types of robots, dynamic stabilization of robots, Determination of HP of motor and gearing ratio, variable speed arrangement, had acid and nickel cadmium batteries, path determination, vision, ranging, laser, acoustics and tactile sensors.

MODULE – II

Manipulators, actuators and grippers, construction of manipulators, Manipulator dynamics and force control, Electronics and pneumatic manipulator, control circuits, pneumatic hydraulic and electric actuators and effectors, various types of grippers, design considerations.

MODULE – III

Kinematics – Homogeneous Co-ordinates, solution of inverse. Kinematic problem, multiple salutations Jacobians, Work envelope.

MODULE – IV

Arduino Programming concept for Arduino Logic Building Robotic Automation, Basic programming, Basic of Relay, Real world timing and delay function

MODULE – V

Arduino for Building Robotics Applications, Advantages of using Arduino, Concepts of Different types of sensors, Application of different sensors, Interfacing with single sensor Interfacing with multiple sensors, Types of motors, Motor controllers, Control motor speed. Introduction to BLE, Communicate with BLE Assembling and Programming robot

Texts:

1. Kenneth J Waldron, *Kinematics, Dynamics & Design of Machinery*, Gary L. Kinzel, John Wiley & Sons, India.
2. Craig, *Introduction to Robotics*, Pearson Prentice Hall.

3. Murray, R.M., Li, Z., and Sastry,S.S.,*A Mathematical Introduction to Robotic Manipulator*, CRC Press, 1994.
4. Jeremy Blum, *Exploring Arduino: Tools and Techniques for Engineering Wizardry* Paperback – 9 Aug 2013
5. Erik Savasgard, *Arduino: 101 Beginners Guide* Paperback – July 29, 2015
6. John-David Warren, Josh Adams, Harald Molle, *Arduino Robotics* 1st ed. Edition
7. "The official raspberry pi projects book"- from the makers of magpi, the official RaspberryPi magazine
8. "Raspberry Pi Cookbook" - Simon Monk, Oreilly ,201

SEMESTER – V

IIAS505 CONTROL THEORY AND PROCESS CONTROL INSTRUMENTATION

Objective: This course in Process Control Instrumentation generally introduces the fundamental concepts, principles and application of control theory and controller design to the undergraduate students. Instrumentation part will consist of valve characteristics, various measuring devices, instrumentation symbols, introduction to P&ID and complex systems.

MODULE – I

Open loop, Closed loop control system, Introduction to Laplace transform, inverse Laplace transform, Block diagram reduction techniques - problems signal flow graph Mason's gain formula – problems

MODULE – II

SIMPLE PROCESS CONTROL SYSTEMS AND TERMINOLOGY

Process – Continuous and Batch process – process variables Functional block diagram of an automatic process control system – set point – measured value – error - simple liquid level control system – flow control system – temperature control system with transportation lag – self regulation

MODULE – III

CONTROL PRINCIPLES

Controller – reverse and direct action, controller modes – discontinuous – ON-OFF Control with differential gap, without differential gap – continuous – proportional controller – proportional band (PB) – effect of PB on a controller output – offset – integral control – Derivative control - PI – PD-PID definition, salient features, applications and limitations of above controllers – selection of control action – electronic controllers – error detector – two position controller – P,I,D, PI, PD, PID controllers – pneumatic controllers f or PID a cti on – flapper nozzle mechanism, pneumatic relay

MODULE – IV

TUNING OF CONTROLLERS

Concept of tuning – criteria for controller tuning – quarter Decay ratio, IAE, ISE, ITAE – methods of tuning – open loop response method – process reaction curve – closed loop response method – ultimate cycle method - damped oscillation method. Curriculum Development Centre, DOTE.

MODULE – V

FINAL CONTROL ELEMENTS

Signal converters – P to I converter, I to P converter – actuator – electrical, pneumatic, hydraulic– control valve – characteristics - quick opening, linear, equal percentage- pneumatic valve – solenoid valve –split range control valve – single seat and double seat plug – electric motor actuated control

valve – control valve sizing – CV rating – selection of a control valve – effect of cavitation and flashing on control valve performance

Texts:

1. C.D. Johnson, *Process control instrumentation technology*, (Page No. 1-10, 440-476, 483-504, 339-342)
2. S B Thakore & B I Bhatt, *Introduction to Process Engineering and Design*, Tata McGraw-Hill publishing company Limited, Newdelhi
3. Nagoorkani, *Control systems*, RBA publishers,2006
4. Benjamin S.Kuo, *Automatic control system*, Printice Hall of India Pvt. Ltd., Seventh edition,1995.
5. I.J.Nagrath and M.Gopal, *Advanced control theory*, New Age international publishers, 2nd edition, 2002
6. M.N. Bandyopadhiyay, *Control Engineering Theory & Practice,* PHI

SEMESTER – V

IIAS506 PROJECT III – INSTRUMENTATION AND AUTOMATION

Students must do this project individually. And it should cover important aspects of embedded system, robotics, industrial instrumentation, automated instrumentation that the student studied up to the fifth semester of his/ her course.

For this project students should complete an automated embedded instrumentation circuit. Project should be worked out through various production stages under the guidance and approval of the supervising faculty/faculties. Students have to complete the project within the given time period, and they should keep all the important paper works (abstract, design, working principle, data sheet data collection etc.) along with them.

Students must submit the finished project along with the required paper works and a comprehensive report, to the Head of the Department, before the day of the project evaluation. The project will be evaluated by the external and internal examiners appointed by the university. Delayed, incomplete submissions will be considered as per the University rules.

SEMESTER – VI

BOCG601 ENTREPRENEURSHIP DEVELOPMENT

Objective: To familiarize the students with the concept and overview of entrepreneurship with a view to enhance entrepreneurial talent. To impart knowledge on the basics of entrepreneurial skills and competencies to provide the participants with necessary inputs for creation of new ventures. To explore new vistas of entrepreneurship in 21st century environment to generate innovative business ideas.

MODULE – I

To make the students understand about entrepreneurs and different classifications. Entrepreneur and etrepreneurship - Definition; traits and features; classification; Entrepreneurs; Women entrepreneurs; Role of entrepreneur in Entrepreneurs in India.

MODULE – II

Create an awareness about EDP. Entrepreneurial development programme concept; Need for training; phases of EDP; curriculum & contents of Training Programme; Support systems, Target Groups; Institutions conducting EDPs in India and Kerala.

MODULE – III

General awareness about edeutification of project financing new enterprises. Promotion of a venture; opportunity Analysis Project identification and selection; External environmental analysis economic, social, technological an competitive factors; Legal requirements for establishment of a new unit; loans; Overrum finance; Bridge finance; Venture capital; Providing finance in Approaching financing institutions for loans.

MODULE – IV

To identify different Discuss opportunities in small business. Small business Enterprise - Identifying the Business opportunity in various sectors - formalities for setting up of a small business enterprise - Institutions supporting small business enterprise - EDII (Entrepreneurship Development Institute of India), 0 SLDO (Small Industries Development Organization NSIC (National small Industries Corporation Ltd. (CNSIC) NIESBUD (National Institute for Entrepreneurship and small Business Development) Sickness in small business enterprise causes and remedies.

MODULE – V

To understand about a project report relating to a small business. Project formulation - Meaning of a project report significance contents formulation planning commissions guideline for formulating a project report - specimen of a project report, problems of entrepreneurs case studies of entrepreneurs.

Books for Reference:

1. Cliffton, Davis S. and Fylie, David E., *Project Feasibility Analysis*, John Wiley, New York, 1977.
2. Desai A. N., *Entrepreneur and Environment*, Ashish, New Delhi, 1990.
3. Drucker, Peter, *Innovation and Entrepreileurship*, Heinemann, London, 1985

4. Jain Rajiv, *Planning a Small Scale Industry*: A guide to Entrepreneurs, S.S. Books, Delhi, 1984
5. Kumar S. A., *Entrepreneurship in Small Industry*, Discovery, New Delhi, 1990

McCleffand, D. C. and Winter, W. G., *Motivating Economic Achievement*, Free Press, New

SEMESTER – VI

IIAG602 DISTRIBUTED CONTROL SYSTEM

Objective: To analyse current philosophy, technology, terminology, and practices used in automation industries. Evaluate computer based automation system used in industries ranging from discrete, continuous process to hybrid processes. Select hardware and software for modern automation system required for industrial application.

MODULE – I

DCS – Introduction & Development History Early Computer systems: Direct digital control, Centralized computer system, Distributed control Hierarchical Control: Hierarchical computer system for a large manufacturing process, overall task, detail task listing, lower level computer task, higher level computer task.

MODULE – II

DCS-Basic packages Analog control, direct Digital control, Distributed process control, DCS configurations Local Control Units (Relay rack mounted equipment) :Dedicated card controllers, Unit operations controllers, Multiplexers- Design, system configuration, Remote stations, Super-commutation and sub-commutation - Power supplies, - Input/ Output, - Controller file The control console equipment: - Video display, - key board, - peripheral devices, - Displays: Group displays, Overview displays, Detail displays, Graphic displays, Trend displays, Alarm reporting, generation and acceptance Communication between components: Data highway designs, highway compatibility, Network access protocols, Network topologies, Maintenance considerations-Reliability, availability, Single loop integrity, backup systems, Redundant and Fault tolerant systems

MODULE – III

Software configuration Operating system configuration, - Controller function configuration, - Algorithm libraries, Process control programming: - Types of program, Features of process control programs, The executive program, Programming language for process control Algorithms- The position algorithm, Velocity algorithm, cascade and ratio control, Feed-forward, Other algorithm like Dead band control, emergency response, error squared

MODULE – IV

System Integration with PLC and computers Supervisory computer functions: Supervisory control and optimization, production monitoring and control, on-line information system DCS and supervisory computer displays- Display access method, display features, alarm access architecture, voice input machine interface Man Machine Interface – Sequencing, Supervisory control Computer interface with DCS- Hardware: Gateway, Interface with PLC, Interface with Direct I/O, Network linkages, Links between networks

MODULE – V

Field buses, MAP/TOP, Network protocol Computer integrated processing, communication hierarchy Industrial communication systems: Management system – MAP/TOP protocol Field buses- fieldbus standardization, Smart transmitters- Rackbus: Bus access method, transmitter, gateways, availability MODBUS - bus access method, application services, transmission modes, function, acceptance PROFIBUS- bus access method, data link services, application services, acceptance FIPBUS - bus access method, other features, acceptance International FIELDBUS standard

Texts:

1. Bela G. Liptak, *Process Control- Instrument Engineers Handbook*, Chilton book co.
2. KLS Sharma, *Overview of Industrial Process Automation,* Elsevier pub.
3. *Practical Distributed Control Systems (DCS) for engineers and technicians*, IDC Technologies
4. D. Popovic and V. Bhatkar, Marcel Dekker, *Distributed Computer Control Systems in Industrial Automation*,

SEMESTER – VI

IIAG603 PIPING AND INSTRUMENTATION DIAGRAMS

Objective: This course provides students with the basic skills they will need to prepare a wide range of Instrument drawings. It presents a step-by-step approach to the basic fundamental's students will need to begin a successful career in industrial instrumentation and design. This course also provides training for sketching the different graphical symbols for piping and joints.

MODULE – I Process Flow Sheet Symbol

Process line symbols, Symbols of valves, Symbols of actuator with and without positioner or another pilot. Furnace and boiler symbols, Heat transfer symbols Pump and compressor, Drivers, Process pressure vessels, Dryers Material handling equipments, Size reducing equipments Process Equipment, Separator

MODULE – II Flow Sheet and Line Symbols

Flow sheet code letter service, Symbol for Lines Utility symbols Drainer, strainer, filter, mixer, twin basket filter, spray nozzle, suction Tee, ejector- educator-injector and exhauster, Horn, Air cleaner, steam separator, bootleg, seal legs, Hose reel, gage hatch, man-hole, flame arrester, diffuser, car sealed open-car sealed close-locked open-locked close, steam exhaust head winter type drain Process and utility flow sheet for drives

MODULE – III Instrument Symbol and Identification

Instrument identification or tag number, identification of letter Instrument line symbols, Symbols of function designations for relays, Symbols for primary location, field mounted, auxiliary location for discrete instruments, shared display and control, computer function and PLC Symbols for self-actuated regulators, valves and other devices for: Flow, Level, Pressure, Temperature, Traps, Multiple way valves, Primary element symbols (A to Z), Function symbols (A to Z)

MODULE – IV Logic Function, PLC and Distributed Control Display Symbols

Logical function symbols Gates, Transmission and Switching symbols, Timer, Switching symbols for PLC- Push buttons, Foot switch, Limit switch, Process parameter switch, Output device, Distributed control / shared display symbols (As per ISA)- Normally accessible to operator, Not Normally accessible to operator iii. Auxiliary operator's interface device Distributed control Computer symbols i. Normally accessible to operator ii. Not normally accessible to operator Distributed control logic/sequential Control Symbols-Normally accessible to operator, Not normally accessible to operator. Miscellaneous symbols- Computing/signal conditioning, software system link

MODULE – V Piping and Fluid Power Symbols

Piping symbols for Bushing, Cap, reducing cross, straight size cross, Cross over, 45˚ Elbow, 90˚ Elbow, long radius double branch, reducing double branch, Connecting pipe joint, Expansion pipe joint, Lateral, reducing flange, bull plug, pipe plug, sleeve, reducing tee, straight size tee, output up tee, output down tee, union. Flow Obstruction symbols. Fluid power symbols- Line technique,

Flow direction of pneumatic, hydraulic, Rotating coupling, vented reservoir, pressurized reservoir, reservoir with connecting line for above fluid level, reservoir with connecting line for below fluid level, vented manifold, Accumulator, Spring loaded accumulator Gas charged accumulator, Air/Gas receiver, fluid conditioners. Heater, Cooler, Temperature controller, filter-strainer, manual drain separator, automatic drain separator, manual drain filter-separator, automatic drain filter- separator, chemical dryer, lubricator with less drain, Lubricator with manual drain v. Hydraulic and pneumatic Cylinders, Pressure intensifier, servo positioner, discreate positioner Actuator and control, Electrical / hydraulic, pneumatic Motors and pumps, Instruments(pressure /temperature / flow indicator-recorder), Sensing, Valve

Texts:

1. W.G. Andrew/ H.B.Williams, *Applied Instrumentation in the process industries*, vol.3 - Gulf publishing co. Kuwait 2012
2. *DOE Fundamental handbook engineering symbology, prints and drawing* - Department of energy- Department of energy USA 2012
3. Frederick A. Meier and Clifford A. Meier, *Instrumentation and control system documentation,* ISA USA year 2004 awarded best-selling ISA book
4. Bhanot Surekha, Process control principles and applications, Oxford University Press year 2011

SEMESTER – VI
IIAS604 ADVANCED EMBEDDED AUTOMATION

Objective: The goal of this course is to teach all the assembly instructions of ARM processor and its internal functioning, enabling students to understand any other processor architectures at ease. The objectives of this course are to understand the integration and control of analog and digital electronics to sophisticated single board computers and microcontrollers

MODULE – I

Advanced RISC Machine – Architecture Inheritance – ARM Programming Model – ARM Development Tools – 3 and 5 stages Pipeline ARM Organization.

MODULE – II

ARM Instruction Execution and Implementation – ARM Co-Processor Interface, ARM Instruction Types – Data Transfer, Data Processing and Control Flow Instructions

MODULE – III

ARM Instruction Set – Co-Processor Instructions – Data Processing Instruction – Data Transfer Instruction – Control Flow Instructions

MODULE – IV

Home Automation using Raspberry Pi and Arduino: Building upon the First Project, Temperatures storage – Setting up a Database to Store Results, Open and Close the Curtains Based on the Ambient Light, The future of home automation.

MODULE – V

Programming the Beagle Bone Black: JavaScript Basics, JavaScript Functions and Timers, Arrays, Objects, and Modules, Bone Script, Hardware Interfacing, Using Capes and Modules, Web Interfaces, A Roving Robot, E-mail notifier

Texts:

1. Manuals and Technical Documents from the ARM Inc, web site.
2. Steve Furber, ARM System-on-Chip Architecture, Second Edition, by PEARSON, 2013
3. Simon Monk, “Raspberry Pi Cookbook”, Oreilly, 2013
4. “*The official raspberry pi projects book*”- from the makers of magpi, the official RaspberryPi magazine

SEMESTER – VI

IIAS605 PROCESS CONTROL INSTRUMENTATION

Objective: After learning the course the students should be able to: compare conventional sequential control with programmable logic control system, develop programs using different PLC programming languages for sequential and continuous process interface analog and digital input/ output devices with PLC using different communication protocol, test the PLC based system and troubleshoot the errors associated with it.

MODULE I

PLC Programmable Logic Controllers (PLCs): Introduction; definition & history of the PLC; Principles of Operation; Various Parts of a PLC

The I/O section, Discrete I/O Modules, Analog I/O Modules, Special I/O Modules, I/O specifications, The CPU, Memory design, Memory Types, Programming Devices, Selection of wire types and size.

MODULE II

Fundamentals of Logic

The Binary Concept, AND, OR and NOT functions, Boolean Algebra, developing circuits from Boolean Expression expressions, Producing the Boolean equation from given circuit, Hardwired logic versus programmed logic, Programming word level logic instructions. Converting Relay schematics and Boolean equation into PLC Ladder Programs, Writing a ladder logic program directly from a narrative description.

MODULE III

Various INPUT /OUTPUT Devices and its interfacing with PLC.

Different types of Input devices: Switches: Push button Switches, Toggle Switches, Proximity switches, Photo switches, Temperature Switch, Pressure Switch, and Level Switch,Flow Switches, manually operated switches,Motor starters, Transducers and sensors, Transmitters Their working, specification and interfacing with PLC.

MODULE IV

Basics of PLC Programming

Processor Memory Organization, Program Scan, PLC Programming languages, Relay type instructions, Instruction addressing, Branch Instructions, Internal Relay Instructions, Programming Examine if Closed and examine If Open instructions, Entering the ladder diagram, Modes of operation. Creating Ladder Diagrams from Process Control Descriptions. Ladder diagram &

sequence listing; large process ladder diagram construction, flow charting as programming method, Industrial Examples

MODULE V

PLC INSTRUCTIONS

Bit Logic Instructions: NO, NC, Set, Reset, rising edge Pulse, Falling Edge Pulse, RS, SR, NOP, OUTPUT Clock: READ RTC, SET_RTC. Different Integer Math Instructions:

Addition, Subtraction, Multiplication, Division, Increment, Decrement- Integer, Byte, Double Word. Different Floating-Point Math Instructions: Addition, Subtraction, Multiplication, Division, Programming Timers and Programming Counters Mechanical Timing relay, Timer instructions, ON delay timer instruction, Off-Delay timer instruction, Retentive Timer, Cascading Timers, Counter Instructions, Up-counter, down counter, Up-Down counter, Cascading counters, Incremental encoder counter applications, Combining counter and timer functions, High Speed counter instruction, HSC, examples of counter function industrial application.

Reference Books

1. Frank D. Petrusella, *Programmable logic controller*, Tata McGraw-Hill publication
2. Gary dunning, *Introduction to programmable logic controller,* Thomson Asia Pte Ltd. Publication, Singapore
3. John W. Webb and Ronald A. Reis, *Programmable Logic Controllers: Principles and Applications,* Prentice –Hall India publication, 5thedition
4. W. Bolton, *Programmable Logic Controllers,* Elsevier Newnes publication, 4th edition
5. E.A.Parr, *Programmable Controllers An engineer's guide,* Elsevier Newnes publication 3rdedition
6. S7-200, PLC Manual of Siemens for Instructions
7. S7-300, PLC Manual of Siemens for Instructions
8. T. A. Huges, *Programmable Controller,* ISA publication, 2nd edition
9. John R. Hackworth and Frederick D. Hackworth Jr., *Programmable Logic Controllers: Programming methods and applications*Pearson publication
10. MicroLogix 1000 plc software manual

SEMESTER –VI

IIAS606 INTERNSHIP – III (INSTRUMENTATION INDUSTRY)

After the completion of the Sixth semester, students will have to undergo two weeks 'internship programme in a reputed instrumentation industry to understand various aspects in a design production atmosphere.
Students can choose an industry in India or abroad for their internship. College will provide a certificate to prove their identity. A member of the faculty will supervise the student during their internship.
Studios having the following qualities can be chosen:

a. A minimum of two years' after establishment
b. Should be based on domestic electronic equipment manufacturing.

At the end of the internship, students should prepare a comprehensive report. The report of the work done by the student should be attested by the organization. Student should also produce a certificate of internship from the organization. All the above details should be submitted to the Head of the Department for evaluation.