File Ref.No.21864/GA - IV - J1/2013/CU

UNIVERSITY OF CALICUT

Abstract

BSc in Instrumentation -CUCBCSS UG 2014-Scheme and Syllabus-implemented w.e.f 2018 Admissions- modified- incorporating the revised version of the syllabus of the Complementary courses in the Computer Science that implemented in University w.e.f 2017 admission- Orders issued.

G & A - IV - J

U.O.No. 4200/2018/Admn Dated, Calicut University.P.O, 02.04.2018

Read:-1.U.O.No. 1650/2018/Admn Dated, 08.02.2018.
2.Letter from Chairman Board of Studies in Instrumentation.
3.Orders of the Vice Chancellor in the file of even No. dated 28.03.2018.

ORDER

Vide paper read first above, the revised Syllabus of B.Sc Instrumentation under CUCBCSS Regulations 2014 was implemented w.e.f 2018 Admissions.

Vide paper read second above, the Chairman Board of Studies in Instrumentation has pointed out that the syllbus of the Complementary courses in the Computer Science attached with the syllabus of B.Sc Instrumentation Programme w.e.f 2018 admission onwards was pre-revised one and has forwarded the modified syllbus after incorporating the revised syllabus of Complementary courses in the Computer Science that implemented in University w.e.f 2017 admission.

Vide paer read third above, the Vice Chancellor has ordered to modify the syllabus of B.Sc Instrumentation under CUCBCSS Regulations 2014 w.e.f 2018 Admissions including the revised version of the syllabus of the complementary course in Computer Science that implemented in University w.e.f 2017 admission.

Sanction has, therefore, been accorded to modify the Syllabus of B.Sc Instrumentation under CUCBCSS Regulations 2014 w.e.f 2018 admission onwards after incorporating the revised version of the syllabus of the Complementary courses in the Computer Science that implemented in University w.e.f 2017 admission.

Orders are issued accordingly.

Ajitha P.P

Joint Registrar

To

1. All Affiliated Colleges under University of Calicut.
2. The Controller of Examinations, University of Calicut. EX branch,JCE 4

Forwarded / By Order

Section Officer

UNIVERSITY OF CALICUT

B.Sc. INSTRUMENTATION

CORE AND COMPLEMENTARY PROGRAMMES

STRUCTURE, SCHEME and SYLLABUS

2018 Admission Onwards

UNIVERSITY OF CALICUT

REGULATIONS GOVERNING

BACHELOR OF SCIENCE IN INSTRUMENTATION

1.0 Title of the programme:

This programme shall be called BACHELOR **OF SCIENCE IN INSTRUMENTATION** under CUCBCSS UG Regulations 2014.

2.0 Highlights of the programme

2.1 Aim and objective:

Emerging trends and stimulating developments in the field of science, increasing opportunities and demands at workplace have made it imperative that the undergraduate science courses be redesigned to cater to the professional aspirations of the students. The present world is in need of professionals who are experts in the respective fields and hence restructuring of any science course should possess components as catalyst to achieve the goals. The boundaries between different domains of science are disappearing and more exciting developments are being reported from areas at the crossing point of disciplines. In response to these changes taking place in society, the University of Calicut has embarked on a major restructuring exercise for its science courses, introducing BSc courses in alternate pattern.

BSc INSTRUMENTATION Programme is one such course in science stream under CCSS of University of Calicut. This restructured undergraduate science course provides students with a broad-based exposure to the critical domains of sciences with adequate background of mathematical sciences. The tools and techniques of computer applications, modern instrumentation, electronics and analytical techniques have a major role in curriculum. The open courses offered ensure adequate exposure to global and local concerns that explore the many aspects of societal relevance in environmental science .It also gives opportunity to explore the multi-disciplinary nature of science.

This course is to equip 10+2 (Science Group) students with the theory of Instrumentation and also to train them in achieving technical expertise in instrumentation. We aim to provide a solid foundation in all aspects of Instrumentation and to show a broad spectrum of modern trends in the subject and also to develop experimental, computational and mathematical skills of

students. The syllabi are framed in such a way that it generates graduates of the calibre sought by industries and public service as well as academic teachers and researchers of the future.

2.2 Job Potential: Instrumentation is the eyes and ears of the control system allowing the operators to see what is going on within the plant or system being controlled. This ability is not just important to the real world but also the design laboratory since if we can see what is going on and determine how to make it operate more efficiently, with less wasted effort and energy, and a greater level of safety and cost effectiveness thus creating a better product. The BSc Instrumentation graduates will be useful as scientific and laboratory assistants to assist design specialties as well as maintenance personal in industries especially in oil and gas sector. Biomedical Instrumentation introduced in the curriculum will make graduates useful in the medical field. The project work will equip them to cater to the specialized needs of industry, scientific laboratories, medical electronics and precision technology fields.

2.3 Higher Studies: These students can continue to take up MSc Instrumentation, MSc Biomedical Instrumentation, MSc Electronics & Instrumentation, MSc Instrumentation Technology, MCA, MBA etc

3.0 Eligibility for admission:

Any candidate who has passed the Plus Two (Science Group) of the Higher Secondary Board of Kerala or Pre Degree of Calicut University or that of any other University or Board of Examinations recognized as equivalent to the Plus Two of the Higher Secondary Board in Kerala, with ***mathematics*** as one of the optional subject, is eligible for admission.

4.0 Duration of the programme:

The duration of the programme of study in BSc Instrumentation is three academic years with six semesters and 120 credits.

5.0 Medium of Instruction:

The medium of instruction and examination shall be English.

6.0 Courses of study:

Total number of courses for the whole BSc Instrumentation programme is 36. It is divided in to four groups namely.

1. Common courses: Category of courses covering languages, literature of which is compulsory for all students.

2. Core courses :(Courses in the subject of specialization)

3. General Courses: For the purpose of selecting general courses in this programme, B.Sc. Instrumentation can be included in group 3 of the language reduced pattern subjects along with Computer science, Electronics and Multimedia. General Courses I, II, III, IV are Basic Numerical Skill, General Informatics, Entrepreneurship Development, and Basics of Audio & Video Media respectively.

4. Complementary courses :(Courses which would enrich the study of core course)

a) Computer Science

b) Applied Physics

5. Open course: Course outside the field of specialization which can be opted by the student.

Mark Distribution and Indirect Grading System:

Mark system is followed instead of direct grading for each question. After external and internal evaluations marks are entered in the answer scripts. All other calculations, including grading, will be done by the university using the software. Indirect Grading System in 7 point scale is followed. Each course is evaluated by assigning marks with a letter grade. (A+, A, B, C, D, E or F) to that course by the method of indirect grading.

Mark Distribution:

Sl No	***Course***	***Marks***	***Credits***
1	English (4 Courses×100 Marks)	**400**	**14**
2	Additional Language (2 Courses×100 Marks)	**200**	**8**
3	General course – engaged by core (4 Courses×100 Marks)	**400**	**16**
4	Core course: Instrumentation - (Theory & Practical) (17 Courses×100 Marks) + Project (50 Marks)	**1750**	**56**
5	Complementary course I: Computer Science - (Theory & Practical) (5 Courses×80 Marks)	**400**	**12**
6	Complementary course II: Applied Physics - (Theory & Practical) (5 Courses×80 Marks)	**400**	**12**
7	Open Course	**50**	**2**
	Total	**3600**	**120**

Seven point Indirect Grading System:

% of Marks	*Grade*	*Interpretation*	*Grade Point Average*	*Range of Grade Points*	*Class*
90 and above	A^+	Outstanding	6	5.5 - 6	First Class with distinction
80 to below 90	A	Excellent	5	4.5 – 5.49	
70 to below 80	B	Very good	4	3.5 – 4.49	First Class
60 to below 70	C	Good	3	2.5 – 3.49	
50 to below 60	D	Satisfactory	2	1.5 – 2.49	Second Class
40 to below 50	E	Pass/Adequate	1	0.5 – 1.49	Pass
Below 40	F	Failure	0	0 – 0.49	Fail

CREDIT AND MARK DISTRIBUTION IN EACH SEMESTERS
Total Credits: 120; Total Marks: 3600

COURSE STRUCTURE

SEMESTER I					
Sl.No	***Course code***	***Course Title***	***Hrs/W***	***Credit***	***Marks***
1	A01	Common course: English	4	3	100
2	A02	Common course: English	5	4	100
3	A07	Common course: Additional Language	5	4	100
4	IN1B-01	Applied Mathematics I (Core)	3	4	100
5	CS1C-01	Computer Fundamentals (Complementary)	2	3	80
6	CS1C-01(L)	MS Office Lab(Complementary)	2	-	-
7	API1CI-01	Methodology of Science & Physics(Complementary)	2	2	80
8	API1CI-01(L)	General Physics Lab(Complementary)	2	-	-
TOTAL			**25**	**19**	**560**

SEMESTER II					
Sl.No	***Course code***	***Course Title***	***Hrs/W***	***Credit***	***Marks***
1	A03	Common course: English	4	3	100
2	A04	Common course: English	5	4	100
3	A09	Common course: Additional Language	5	4	100
4	IN2B-02	Applied Mathematics II (Core)	3	4	100
5	CS2C-02	Fundamentals of System Software, Networks and DBMS (Complementary)	2	3	80
6	CS2C-02(L)	HTML & MYSQL Lab.(Complementary)	2	-	-
7	API2C-02	Basic Electronic Devices and Circuits(Complementary)	2	2	80
8	API2C-02(L)	Basic Electronics Lab(Complementary)	2	-	-
TOTAL			**25**	**19**	**560**

SEMESTER III					
Sl.No	***Course code***	***Course Title***	***Hrs/W***	***Credit***	***Marks***
1	A11	General Course I -engaged by core	4	4	100
2	A12	General Course II –engaged by core	4	4	100
3	IN3B-03	Measurement Techniques (Core)	4	4	100
4	IN3B-04	Transducers (Core)	3	3	100
5	CS3C-03	Problem solving using C programming (Complementary)	3	2	80

6	CS3C-03(L)	C programming (Complementary)	2	-	-
7	API3C-03	OP-AMP and Applications. (Complementary)	3	2	80
8	API3C-03(L)	OP-AMP Lab. (Complementary)	2	-	-
TOTAL			**25**	**19**	**560**

SEMESTER IV					
Sl.No	***Course code***	***Course Title***	***Hrs/W***	***Credit***	***Marks***
1	A13	General Course III- engaged by core	4	4	100
2	A14	General Course IV- engaged by core	4	4	100
3	IN4B-05	Industrial Instrumentation I (Core)	3	2	100
4	IN4B-06	Electrical & Electronic Instrumentation (Core)	4	2	100
5	CS4C-04	Data Structures Using C programming (Complementary)*	3	2	80
6	CS4C04(L)	. (Complementary)*	2	-	-
7	CS4C-04(P)	Programming Lab: C and Data Structures (Complementary)*	-	4	80
8	API4C-04	Digital Integrated Circuits. (Complementary)*	3	2	80
9	API4C-04(L)	Digital Electronics Lab. (Complementary)*	2	-	-
10	API4C-05(P)	Applied Physics Lab. (Complementary)*	-	4	80
TOTAL			**25**	**24**	**720**

SEMESTER V					
Sl.No	***Course code***	***Course Title***	***Hrs/W***	***Credit***	***Marks***
1	IN5B-07	Industrial Instrumentation II (Core)	3	3	100
2	IN5B-08	Control Systems (Core)	3	3	100
3	IN5B-09	Analytical Instrumentation (Core)	4	4	100

4	IN5B-10	Optoelectronic Instrumentation (Core)	4	3	100
5	IN5B-11	Microprocessors (Core)	3	3	100
6	IN5B-16(L)	Microprocessor & Microcontroller Lab (Core)**	3	-	-
7	IN5B-17(L)	Instrumentation & Process Control Lab (Core)**	3	-	-
8	IN5D-01 IN5D-02 IN5D-03	Open Course: ✓ Elements of Environmental Science ✓ Energy resources and utilization methods ✓ Science of equipments and instruments in modern life	2	2	50
TOTAL			**25**	**18**	**550**

SEMESTER VI					
Sl.No	***Course code***	***Course Title***	***Hrs/W***	***Credit***	***Marks***
1	IN6B-12	Process Control Instrumentation	4	3	100
2	IN6B-13	Biomedical Instrumentation (Core)	5	3	100
3	IN6B-14	Microcontrollers (Core)	4	2	100
4	IN6B-15a IN6B-15b IN6B-15c	Elective Courses: (Core)*** ✓ Power Plant Instrumentation ✓ Instruments-Principles and applications ✓ Programmable Logic Controllers and SCADA	4	3	100
5	IN6B-16(P)	Microprocessor & Microcontroller Lab (Core)**	3	4	100
6	IN6B-17(P)	Instrumentation & Process Control Lab (Core)**	3	4	100
7	IN6B-18(Pr)	Project (Core)	2	2	50
TOTAL			**25**	**21**	**650**
Grand Total				**120**	**3600**

* Practical Examination will be held at the end of 4th semester

** Practical Examination will be held at the end of 6th semester

*** An institution can choose any one among the three courses.

Open Courses –Other Stream

1. IN5D-01 Elements of Environmental Science
2. IN5D-02 Energy Resources and Utilization Methods
3. IN5D-03 Science of Equipments and Instruments in Modern Life

Elective Courses - Same Stream

1. IN6B-15a : Power Plant Instrumentation
2. IN6B-15b : Instruments-Principles and Applications
3. IN6B-15c : Programmable Logic Controllers and SCADA

Compulsory assignment

Study report on a local Environmental issue shall be a compulsory assignment among the components for internal evaluation of Open and Elective Courses offered under BSc Instrumentation Programme.

- **Core Course –Theory Evaluation Scheme**

The evaluation scheme for each course contains two parts: *viz.*, internal evaluation and external evaluation. Maximum marks from each unit are prescribed in the syllabus.

1. Internal Evaluation: 20% of the total marks in each course are for internal evaluation. The colleges shall send only the marks obtained for internal examination to the university.

Table 1: Components of Evaluation.

Sl No	***Components***	***Marks***
1	Attendance	5
2	Test papers: I & II	5 + 5
3	Assignment	2
4	Seminar/ Viva	3
	Total Marks	20

Table 2: Percentage of Attendance and Eligible Marks

% of Attendance	***Marks***
Above 90%	5
85-89%	4
80-84%	3
76-79%	2
75%	1

Table 3: Pattern of Test Papers: (Internal)

Duration	***Pattern***	***Total number of questions***	***Number of questions to be answered***	***Marks for each question***	***Marks***
1.5 Hrs	One word	5	5	1	5
	Short answer	5	5	2	10
	Paragraph	5	3	5	15
	Essay	2	1	10	10
				*Total Marks**	40

(*90% and above = 5, 80 to below 90% = 4.5, 70 to below 80% = 4, 60 to below 70% = 3.5, 50 to below 60% = 3, 40 to below 50% = 2, 35 to below 40% = 1, below 35% = 0)

2. External Evaluation: External evaluation carries 80% marks. University examinations will be conducted at the end of each semester.

Table 1: Pattern of Question Paper.

Duration	***Pattern***	***Total number of questions***	***Number of questions to be answered***	***Marks for each question***	***Marks***
3 Hours	One word or one phrase or true or false	10	10	1	10
	Short answer (one or two Sentence)	12	10	2	20
	Paragraph/half page	9	6	5	30
	Essay	4	2	10	20
Total Marks					**80**

- **<u>Practical Examination (Core): Evaluation Scheme</u>**

The practical examinations for the complementary and core courses shall be conducted by the University at the end of semesters 4 and 6 respectively. The examiners shall be selected from a panel of experts prepared by the University. For each examination centre there shall be one external examiner (Chief) and one internal examiner (Additional). The evaluation scheme for the end semester practical examinations shall be as follows:

Internal:

Component	*Marks*
Attendance	5
Lab Involvement	5
Laboratory Record	10
Total	**20**

External:

Component	*Marks*
Laboratory Record	10
Formulae, Theory, Principle / Programme/ Circuit, brief Procedure	10
Setting and experimental skill	10
Observations & tabulations	10
Substitution, Calculation, Results, Graph	20
Viva	20
Total	**80**

- **Core Course Project: Evaluation Scheme**

Project evaluation shall be conducted at the end of sixth semester. 20 % of marks are awarded through internal assessment. The project work provides the opportunity to study a topic in depth that has been chosen or which has been suggested by a staff member. The student's first carryout a literature survey which will provide the background information necessary for the investigations during the research phase of the project. The various steps in project works are the following:-

1. Wide review of a topic.
2. Investigation on an area of Instrumentation in systematic way using appropriate techniques.
3. Systematic recording of the work.
4. Reporting the results with interpretation in written and oral forms.

Project topics:

1. Study and design of Process and control instrumentation in an industry.
2. Instrument based Environmental monitoring and impact study
3. Trouble shooting and calibration of instruments.
4. Design & construction of models for science teaching.
5. Design & Control of Process stations or machineries using controllers.

Internal Evaluation:

Criteria	***Marks***
Punctuality & Log book	2
Skill in doing project work/data	3
Scheme Organization of Project Report	2
Viva	3
Total	**10**

Use of Log Book: During the Project the students should make regular and detailed entries in to a personal laboratory log book through the period of investigation. The log book will be a record of progress on project and will be useful in writing the final report. It contains experimental conditions and results, ideas, mathematical expressions, rough work and calculation, computer file names etc. All entries should be dated. The students are expected to have regular meeting with their supervisor to discuss progress on the project and the supervisor should regularly write brief comments with dated signature. The log book and the written report must be submitted at the end of the project.

External Evaluation.

Criteria	***Marks***
Originality of approach & Methodology	5
Relevance of the topic / Statement of Objectives	5
Involvement / Use of statistical tools	5
Project Report & log book	5
Oral Presentation/Quality of Analysis.	10
Viva-Voce	10
Total	**40**

- **Open Course: Evaluation Scheme**

INTERNAL EVALUATION. (20% of the total marks are for internal evaluation)

Component	***Marks***
Attendance	2.5
Assignment/Seminar	2.5
Test 1	2.5
Test 2	2.5
Total	**10**

Percentage of Attendance and Eligible Marks:

% of Attendance	*Marks*
Above 90%	2.5
85-89%	2
80-84%	1.5
76-79%	1
75%	0.5

Pattern of Test Papers: (Internal)

Duration	*Pattern*	*Total number of questions*	*Number of questions to be answered*	*Marks for each question*	*Marks*
2 Hours	One word	4	4	1	4
	Short answer	2	2	2	4
	Paragraph	2	1	4	4
	Essay	2	1	8	8
				*Total Marks**	20

(*Marks: 80% and above = 2.5, 60 to below 80% = 2, 50 to below 60% = 1.5, 40 to below 50% = 1, 35 to below 40% = 0.5, below 35% = 0.)

EXTERNAL EVALUATION: External evaluation carries 80% marks.

Pattern of Question Paper.

Duration	*Pattern*	*Total number of questions*	*Number of questions to be answered*	*Marks for each question*	*Marks*
1 Hour	One word	5	5	1	5
	Short answer	5	5	2	10
	Paragraph	5	3	5	15
	Essay	3	1	10	10
				Total Marks	40

Core Courses under BSc INSTRUMENTATION Programme

SEMESTER I

Text Book: Thomas / Finney: Calculus, 9th ed., LPE, Pearson Education

SEMESTER I

Core Course (IN1B-01)

APPLIED MATHEMATICS-I

54 Hrs - 3Hrs / W - Credit 4

Module I : Limits & Continuity

Limits and Continuity: Rules for finding limits. Target values and formal definitions of limits. Extensions of limit concept, Continuity, Tangent lines .

Module II : Derivatives & Applications of Derivatives

Derivatives: The derivative of a function, a quick review of differentiation rules, rate of change.

Application of derivatives: Extreme values of a function, Rolle's theorem- Mean value theorem, Intermediate forms, The L'Hopital's Rule .

Module III: Integration & Applications of Integration

Integration: Properties of definite integrals, area under the graph of a function, average value of an arbitrary continuous function, mean value theorem for definite integrals.

Application of Integrals: Areas between curves, Lengths of plane curves, Areas of surfaces of revolution.

Module IV: Ordinary Differential Equations

Basic concepts and ideas). Direction Fields, Separable Differential Equations. Exact Differential Equations; Integrating Factors, Linear Differential Equations; Orthogonal Trajectories of Curves.

Books for Reference

1. Anton : Calculus, Wiley.
2. S.K. Stein : Calculus with Analytic Geometry, McGraw Hill.
3. S. S Sastry Engineering mathematics Vol 1&2, PHI
4. B.S.Grewal Engineering Mathematics
5. Manickyavachakom Pillai Advanced Mathematics Vol 1&2
6. Mathematical Physics - Satya Prakash, Sultan Chand &Sons, New Delhi
7. N.Piskunoy Differential and Integral Calculus MIR Publications
8. Thomas .G.B Calculas and Analytic Geometry Addison Wesley Inc

9. C.R Wylie and Barrett Advanced engineering mathematics Mc-Graw Hill
10. E.Kreyszig Advanced engineering mathematics Wiley Eastern Limited

SEMESTER II

Text Book: Thomas / Finney : Calculus, 9th ed., LPE, Pearson Education
S.C Gupta, V.K Kapoor - Fundamentals of Mathematical Statistics – S Chand & sons

SEMESTER II
Core Course (IN2B-02)
APPLIED MATHEMATICS-II
54 Hrs - 3Hrs / W - Credit 4

Module 1 – Infinite Series

Limits of sequence of numbers - Theorems for calculating limits of sequences, Infinite series, Integral test for series of non-negative terms , Comparison test for series of non negative terms , Ratio and root test for series of non negative terms , Alternating series, Absolute and conditional convergence.

Module II – Laplace Transforms

Laplace Transforms: Laplace Transform, Inverse Laplace Transform, Linearity, Shifting, Transforms of Derivatives and Integrals, Differential Equations. Unit step Function, Second Shifting Theorem.

Module III – Fourier Series

Fourier Series: Periodic Functions, Trigonometric Series, Fourier Series, Even and Odd functions, Half-range Expansions.

Module lV - Probability & Statistics.

Measures of central tendency:- Arithmetic Mean, Geometric mean, harmonic mean , Median and Mode .
Measures of dispersion:- Range, Mean Deviation, Variance, Standard Deviation, Coefficient of variation.
Classical definition of probability, statistical regularity, frequency definition of probability, Set theory, Permutations and Combinations.

Reference.

1. Anton : Calculus, Wiley.
2. S.K. Stein : Calculus with Analytic Geometry, McGraw Hill.
3. S. S Sastry Engineering mathematics Vol 1&2, PHI

4. B.S.Grewal Engineering mathematics
5. Manickyavachakom Pillai Advanced Mathematics Vol 1&2
6. Irvin Miller, John E Freund Probability and Statistics, PHI

SEMESTER III

Core Course (IN3B-03)

MEASUREMENT TECHNIQUES

72 Hrs- 4 Hrs/W-Credits 4

UNIT I: SCIENCE OF MEASUREMENT

Importance of measurement-purpose of measurement-methods of measurement-functional blocks of a measurement system-Types of errors-Error analysis-Probability of errors-Propagation of errors-Fundamental and Derived units-System of units-Standards of measurement-Classification of standards-Fundamental standards-Electrical standards-Standards for luminous intensity-Standards for pressure.

UNIT II: ELECTRO MECHANICAL INDICATING INSTRUMENTS

Suspension galvanometers-Permanent Magnet Moving Coil Mechanism -Series type ohmmeter-Shunt type ohmmeter-Alternating current indicating instruments-Thermo instruments-Electro dynamo meter in power measurement-Watt hour meter-Power factor meter.

UNIT III: RECORDERS

Basic recording system-strip chart recorder-Galvanometers and potentiometer type recorder- X-Y recorder (Direct and Null type)-Data Logger.

UNIT IV: BRIDGE MEASUREMENT

Introduction-Wheatstone bridge-Kelvin bridge-Guarded Wheatstone bridge-AC bridge and their applications-Maxwell bridge-Hay bridge-schering bridge-unbalance condition-wein bridge-Wagner Ground Connection.

Books for Study

1.Instrumentation Devices and Systems – C.S Rengan, G.P. Sarma and V.V. Mani.
2.Electrical and Electronic Measurement System- A.K.Sawney.

Books for References

1.Modern Electronic Instruments and Measurement Techniques- Albert D. Helfrick and William D. Cooper.
2.Mechanical Measurements- Thomas G. Beckwith and Hen N. Lewis Back Roy , L.Marongohi

SEMESTER III

BSc Instrumentation Programme

SEMESTER 3-Core Course (IN3B-04)

TRANSDUCERS

(54 Hrs- 3 Hrs/W-Credits 3)

UNIT I: INTRODUCTION TO TRANSDUCERS (16 hrs)

Classification of transducers-selecting a transducer-Resistance transducer-Potentiometer-Loading effect on potentiometer-Non linear potentiometer-Resistance strain gauge-Strain gauge circuitry-Semiconductor strain gauge-Resistance thermometer-Thermistor
Inductive transducer-Linear Variable Differential Transducer (LVDT)-Application of LVDT-Rotary Variable Differential Transformer (RVDT)-Pressure transducer- Capacitive Transducer-CD transducer-Practical capacitance pickups-Condenser Microphone

UNIT II: GENERALIZED CHARACTERISTICS OF TRANSDUCERS (14 hrs)

Static characteristics of transducer-Static sensitivity-Linearity-Precision-Accuracy-Threshold-Resolution-Hysterisis-Range and Span-Input impedance and loading effect-Dead band-Backlash-Drift.

UNIT III: DYNAMIC CHARACTERISTICS OF TRANSDUCERS (12 hrs)

Test input-Zero order transducer-First order transducer (Impulse response-Step response-Ramp response-Terminated ramp response-Frequency response)-Experimental determination of time constant-Terminated ramp response-Second order Transducers (Impulse-Step)

UNIT IV: ACTIVE TRANSDUCERS (12 hrs)

Active transducers-thermo electric transducers-static and dynamic characteristics of thermo couple - Piezo electric transducers-Hall effect transducers-electro mechanical transducers-photo electric transducers-photo voltaic cells

Books for Study :

1.Transducers Engineering -Dr. S.Renganathan
2.Electrical and Electronic Instrumentation- A.K.Sawney.
3.Practical Instrumentation Transducers – Oliver L.J, Sir Issac Pitman Publication
4.Instrument Transducer-Neubert H..K.P, Clarender Press

SEMESTER IV

Core Course (IN4B-05)

INDUSTRIAL INSTRUMENTATION I

54 Hrs- 3Hrs/W-Credits 2

UNIT I – MEASUREMENT OF FORCE,TORQUE,SPEED

Measurement Of Force : Standards and calibration-Basic methods of force measurement-elastic force transducer –bonded strain gauge transducers-piezoelectric transducers.
Measurement Of Torque : Torsion bar RVDT-FLAT spiral spring-inductive torque transducer-magnetive strictive transducers-digital methods.
Measurement Of Speed : Electromagnetic tachometers generators(ac & dc)-eddy current or drag cup type tacho generator-photo electric tacho meters-stroboscope.

UNIT II – MEASUREMENT OF TEMPERATURE

Standards for temperature –liquids in glass thermometers-pressure thermometers-thermocouple-common thermocouple-reference junction considerations- thermopile –RTD –bimetallic thermometer-pyrometer-radiation pyrometers-optical pyrometers-thermistors.

UNIT III – MEASUREMENT OF PRESSURE

Standards of pressure-Deadweight gauges-manometers-elastic transducers-bourden tubes-diaphragm-bellows-capacitive –differential pressure transmitter-diaphram type strain gauge pressure transducer.

UNIT IV – MEASUREMENT OF FLOW

Basics of flow measurement-pitiot static tube-flow obstruction elements-flow nozzle-Dahl flow tube-venturi tube –orifice plate-turbine flow meters-reciprocating piston type meter-semi rotary circular piston type-rotameters-float type flow meters-elector magnetic flow meters-hot wire anemometers(constant temperature and constant current)

Books for study

1.Transducers and Instrumentation – D.V.S Murthy
2.Instrumentation measurement and analysis- B.C. Nakra, K.K.Chaudry
3.A course in electrical and electronic measurement and instrumentation- A.K.Sawhrey
4. Industrial Instrumentation & Control – S K Singh

Books for reference

1. Measurement Systems- Ennest O.Doebelin
2. Mechanical and Industrial measurements- R.K.Jain
3. Industrial Instrumentation – Donald P.Eckman

SEMESTER IV

Core Course (IN4B-06)

ELECTRICAL AND ELECTRONIC INSTRUMENTATION

(72 Hrs- 4 Hrs/W-Credits 2)

Module I- Network Theorems and AC Bridges

Electric circuits and Net Work theorems- Kirchoffs laws-Maxwells loop current Method-Nodal analysis-Superposition Theorem- Thevenins theorem- Reciprocity Theorem- Delta/Star and Star/Delta Transformations-Compensation Theorem-Norton's Theorem- Maximum Power Transfer theorem.

Module II- Electrical instruments

Principle and Operation of moving coil galvanometer, DC Ammeters, DC voltmeters. Ohmmeters: Series type, shunt type meters, AC meters .Electrodynamometer type (power) watt meters-methods of connection, errors and their compensation. Principle and Operation thermal type watt meters.

Module III- Analog Instruments

Electronic voltmeter (Transistor and FET versions). DC and AC milli/micro voltmeters, Nano-ammeter. Analog frequency meter. Analog phase meter. Cathode Ray Oscilloscope- Signal beam, Dual trace, Dual beam.

Module IV-Digital instruments & waveform generators

Digital voltmeter. Digital multimeter, Digital frequency meter, Digital phase meter. Q-meter, Storage Oscilloscope, Digital Storage Oscilloscope and Sampling Oscilloscopes. Sine/Square Wave Generator. R.F. Signal Generator. Standard Signal Generator. Function Generator.

Books for study:

1. A text book of Electrical Technology- B.L.Theraja
2. A course in Electrical and Electronic Measurements and Instrumentation-A K Sawhney
3. Electronic Instrumentation – H. S. Kalsi

Books For Reference:

1.Electronic Measurements and Instrumentation – Oliver & Cage
2.Instrumentation Devices and Systems- Rangan, Mani and Sharma
3.Experiments in Electronics- Subramanyam
4.Electronic Instrumentation and Measuring Techniques- Cooper

SEMESTER V

Core Course (IN5B-07)

INDUSTRIAL INSTRUMENTATION II

54 Hrs- 3Hrs/W-Credits 3

UNIT I : MEASUREMENT OF WEIGHT

Differentiation b/n mass and weight-Load cell-Strain gauge type load cells-hydraulic type load cell-Pneumatic type load cell- Continuous weighing – semi continuous feed belt weighing.

UNIT II : LEVEL MEASUREMENT

Visual indicators –displacer method-gamma ray method –ultrasonic method-resistive inductive and capacitive method –hydrostatic tank gauging-level switches-level in open and closed tanks.

UNIT III : MEASUREMENT OF VISCOSITY

Definition of viscosity-and consistency units of viscosity-absolute and kinematic viscosity-Stoke's law-saybolt viscometer-ostwald viscometer-two float viscometer-rotating cylinder type viscometer-ultrasonic shear waves method.

UNIT IV : MEASUREMENT OF HUMIDITY

Absolute humidity-relative humidity-dew point-hygrometers-resistive hygrometers-capacitive crystal and aluminium oxide hygrometer-microwave refractometer-wet and dry bulb temperature-psycho meter.

UNIT V : MEASUREMENT OF DENSITY

Hydrometers-constant volume hydrometers-liquid densitometers based on float principle-air pressure balance method-gamma ray method-hot wire gas density detector-gas impulse wheel method –orifice method.

UNIT VI : MESUREMENT OF pH

pH scale –measurement oh pH-reference electrode-measuring electrode-hydrogen electrode-antimony electrode-their advantages and disadvantages-calomel electrode- pH meter-the sensing devices of pH meter-instruments for the measurement of the emf of the electrodes for pH measurement.

Books for study

1.Transducers and Instrumentation – D.V.S Murthy
2.Instrumentation measurement and analysis- B.C. Nakra, K.K.Chaudry
3.A course in electrical and electronic measurement and instrumentation- A.K.Sawhrey
4. Industrial Instrumentation & Control – S K Singh

Books for reference

1. Measurement Systems- Ennest O.Doebelin
2. Mechanical and Industrial measurements- R.K.Jain
3. Industrial Instrumentation – Donald P.Eckman

SEMESTER V

Core Course(IN5B-08)

CONTROL SYSTEM

(54 Hrs- 3Hrs/W-Credits 3)

Module I - Introduction to control systems.

Review of Laplace transforms Open loop and closed loop systems, Linear and Non-linear, Continuous and Discrete, Time variant and time invariant systems.

Module II - Servomechanism and regulators.

Block diagram representation of control systems, Transfer function-definition. Transfer function of physical systems- Mechanical Translatory and Mechanical Rotational systems. Electrical circuits involving R, L and C. Liquid level systems. Block diagram Reduction techniques, Signal Flow graph, Masons gain formula

Module III - Time Domain Analysis.

Test input signals. Time response of first order systems. Time response of second order systems [no derivations]. Time domain specifications. Error analysis. Static error coefficients. Stability in Time domain. Routh Hurwitz criterion.

Module IV - Frequency Domain Analysis.

Bode plots, Polar plots, Gain margin, Phase margin. Sinusoidal transfer function- Frequency Domain specifications.

Books for study

1.Control systems – Nagrath and M.Gopal

2. Ogata K. Modern Control Engineering, Prentice-HallIndia Ltd /Pearson Education.

Books for references

1. Dorf. Modern Control system. Pearson Education, 8th ed.
2. Franklin. Feed back Control.S:vstem.\,. Pearson Education
3. Kuo B. C, Automatic COIltrol System. Prentice-Hall India Ltd, 8th ed.
4. Nagoor Kani. Control S.vstems, RB Publishers
5. Ogata. Di.\.crefl' Ti,ne Col/trul Systems. 2nd edn., Pearson EducationJ Prentice- 6.
6. Ramkayan. Control Engineering, Vikas Publications.
7. M N Banrlyopadhyaya. Control Engineering- Theory & Practice, Prentice-Hall

SEMESTER V

Core Course (IN5B-09)

ANALYTICAL INSTRUMENTATION

(72 Hrs -4Hrs/W-Credit 4)

Module I

UV-VISIBLE-NMR spectrophotometers - Basic principles - Laws of photometry –working curve method, standard addition technique- radiation sources - Monochromators - Filter, Prism and grating types - Stray light - Recording instruments - Scanning double beam instruments - PC based spectrophotometer.

Module II

Infrared spectrophotometers- Basic principles - Sources - IR optical systems and components - IR detectors - Data recording - Practical instruments - Fourier transform technique - FTIR principles and instrumentation - Raman spectrometry - Principles and instrumentation.

Module III

Magnetic resonance techniques - Nuclear magnetic resonance - Principles and components - Types of magnets and probes - Measurement techniques.

ESR spectrometer - Principles and instrumentation.

X-ray spectrometer-Principles and instrumentation-X-Ray diffraction spectrometry

Module IV

Mass spectrometry - Principles - Magnetic deflection mass analyser

Chromatography - General principles, classification - Gas and liquid chromatography - chromatography - chromatographic detectors – Gas Liquid Chromatography (GLC) and High Pressue Liquid Chromatography (HPLC) - Principles and instrumentation.

Book for study

1.KHANDPUR.R.S, *Hand book of Analytical instruments*. TMH

Books for References

1.WILLARD,MERRITT DEAN And SETTLE, *Instrument methods of analysis* ,East-west Press1992.

2.SKOOG.D.A And WEST.D.M, *principles of instrumental analysis*- Holt saunders pub.

3.EWING.G.W, *Instrumental methods of analysis*, Mcgraw hill,1992.

4.MANN.C.K,VICKERS.T.J,And GULLICK.W.H, *Instrumental analysis*, HARPER and ROW pub.

5.ROBERT.D.BRAUN, I*ntroduction to instrumental analysis*, Mcgraw hill.

6.FRANK.A.SETTLE, *Hand book of instrumental techniques for Analytical chemistry*, Prentice hall- New Jersey ,1997

7.SKOOG.D.A,HOLLER.F.J And NIEMANN. T.A, *Principles of instrumental analysis*- Saunders, 1998

8.WISTON.C, *X-ray method*,- John wiley- 19

SEMESTER V

Core Course (IN5B-10)

OPTO ELECTRONIC INSTRUMENTATION

(72 Hrs- 4 Hrs/W-Credits 3)

Module I

Optical components-their selection –coating materials employed for reflection and anti reflection coating-diffraction grating-prisms –their mounting techniques for use as monochromatic-comparison of grating and prism spectra.

Module II

Interferometry-michelson, fabry perot,jamin interferometers-interference filters
Modulation of light-electro optic modulation LED, LCD.
Pindiodes, photoemissive, photo conductive, and photo voltaic detectors, photomultiplier tubes.

Module III

Lasers- operation-population inversion-classes of lasers-solid state, gas, dye lasers-semiconductor lasers-Q switching.
Application of laser-laser gyro-laser Doppler anemometry – distance measurement.

Module IV

Holography-optical fibres-principles-step index and graded index,fibres-fibre fabrication –fibre optic components-application of optical fibres-fibre optic sensors.
Measurement of fibre characteristics-attenuation, dispersion and refractive index profile measurement , OTDR-fibre optic components-Couplers, splicers and connectors-applications of optical fibres-optical fibre communications.

Books for study and Reference

1.J.R.Meyer-Arendt,"Introdution to classical and modern optics",PHI
2.J.Wilson and J.F.B Hawkes,"Optoelectronics:An introduction".
3.K.Thyagarajan and A.K.Ghatak,"Lasers and applications".

SEMESTER

(Core Course (IN5B-11)

MICROPROCESSORS

(54 Hrs- 3 Hrs/W-Credits 3)

Module I- Microprocessor Introduction and Architecture

Introduction to Microprocessors, Basic Functional Block Diagram, Evolution of microprocessors, Comparative features of Intel family microprocessor (8085, 8086, 8088, 80168, 80286, 80386 and 80486). Introduction to 8-bit Microprocessors, Pins & Signals of 8085, Architecture of 8085 in detail.

Module II – Instruction set & Assembly language programming

Instruction Set and Assembly Language Programming of 8085:- Instruction set of 8085,Data transfer , arithmetic, logical , branching & machine control instructions. Addressing Modes. Assembly language programming using 8085 Instruction Set, use of Procedure & Macro, delay routine, list and array, stack etc.. , Interrupts in 8085, Programming examples.

Module III- Interfacing & Applications

Peripheral Devices and Interfacing: Interfacing of 8085 with Programmable Peripheral Interface 8255, DMA Controller 8257, DAC Interface, ADC Interface. Application of microprocessor in Temperature control, Stepper Motor Control.

Module IV – Introduction to 16 bit Microprocessors

Introduction to 16-bit Microprocessors, Pins & Signals, Architecture of 8086 in detail, Timing diagrams- Interrupt system of 8086, Addressing modes of 8086.

Books for Study:

1. Microprocessors & Interfacing, Programming and Hardware – Douglas V.Hall.
2. Introduction to Microprocessor – A. P. Mathur (III edition)
3. Microprocessor/Microcomputer for measurement and control – Austander, David M and Paul Sangnes.
4. Microprocessor (8085) and its Applications – A. Nagoor Kani- RBA Publications.
5. Microprocessors & Microcontrollers - A. Nagoor Kani- RBA Publications.
6. Microprocessor Architecture, Programming, and Applications with 8085, Ramesh Gaonkar – Penram International Publishing Pvt Ltd.

Books for Reference:

1. Microcomputer Systems: The 8086/8088 Family Architecture, Programming and Design – Yu-
Cheng Liu and Gienn A. Gibson.
2. Microprocessor and microcomputer-based system design – Mohamed Rafiquzzaman
3. The Intel Microprocessors – Barry B. Brey
4. Microprocessor based system Level V – Technical Education Council Edition

SEMESTER VI

Core Course(IN6B-12)

PROCESS CONTROL INSTRUMENTATION

(72 Hrs- 4Hrs/W-Credits 3)

UNIT I: INTRODUCTION TO PROCESS CONTROL

Introduction to process control. Process control principle. Process control blocks diagram- typical control variables. Criteria to evaluate process loop responses. Examples of digital process control.

UNIT II : CONTROLLER PRINCIPLES

Introduction. Process characteristics, Process equation. Process load, process lag, self regulation. Control system parameters- error, variable range, control parameter range, control lag, dead time, cycling, controller modes- two position mode, multiposition mode, floating control mode, continuous controller mode, proportional control mode, integral control mode, derivative control mode, proportional integral control mode, proportional derivative control mode, Three mode controller

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UNIT III: ANALOG & DIGITAL CONTROLLERS

Analog Controllers

Introduction, general features, Electronic controllers, pneumatic controllers, digital control.

Digital controllers

Introduction, Elementary digital methods, computer data logging, computer supervisory control, direct digital control.

UNIT IV : FINAL CONTROL ELEMENTS & CONTROL LOOP CHARACTERISTICS

Final Control

Introduction, final control operation, signal conversions, actuators, control elements

Control loop characteristics

Introduction, control system configurations, multivariable control system, control system quality, stability, process loop tuning.

Books for study

1.Process Control Instrumentation Technology- Curtis D. Johnson, John Wiley & Sons
2.Control systems – Nagrath and M.Gopal
3. Stephanopoulis, G, Chemical Process Control, Prentice Hall of India, New Delhi.
4. Eckman. D.P., Automatic Process Control, Wiley Eastern Ltd., New Delhi.

Books for references

1.Process Control- Peter Harriot
2.Pollard A.Process Control, Heinemann educational books, London.
3.Control systems –Nagoor Kani.

SEMESTER VI

SEMESTER 6- Core Course (IN6B-13)

BIOMEDICAL INSTRUMENTATION

(90 Hrs- 5Hrs/W- Credit 3)

Module I

Introduction to Biomedical Instrumentation:

Physiological systems of the body, Physiological variables, Bioelectric potentials, Functional block diagram of Biomedical Instrumentation

Electrodes for Bioelectric events:

Electrode potential,Electrode impedance, Types of surface electrodes, Microelectrodes, Bipolar, monopolar and non polar electrodes.

Module II

Electro Cardiography : Cardiovascular systems, Mechanical function of heart, electrical conduction path ways, scalar electrocardiogram, Einthoven triangle, Unipolar and Bipolar limb leads, Augmented leads, chest leads ECG instrumentation

Electro Encephelography : Choice and application of electrodes, Modes of recording, Some typical abnormalities, Different types of EEG waveforms.

Electro Myography : Choice and application of electrodes, Methods of recording

Module III

Measurement of Blood pressure, blood flow and cardiac output:

Systolic and Diastolic pressures, Indirect method of blood pressure measurement, Automated indirect method. Direct method-Magnetic and Ultrasonic blood flow meters, Thermal Convection method, Radiographic method, Indicator Dilution method, Plethysmography

Module IV

Measurement of Heart Sound

Phonocardiogram, Measurement of Respiration rate, Measurement of carbondioxide and oxygen of exhaled air, Measurement of PH of blood, Biological simulators and controllers, Muscle simulators, Diathermy Defibrillators, Cardiac pacemakers.

Books for study and reference

1.L.CROMWELL,F.WEIBEL,E.A.PREIFFER-BIOMEDICAL INSTRUMENTATION AND MEASUREMENT.

2.BIOMEDICAL INSTRUMENTATION-ARUMUGHAM

Books for study and reference

1. MEDICAL INSTRUMENTATION-APPLICATION AND DESIGN BY JOHN G WEBSCER

2.HANDBOOK OF BIOMEDICAL INSTRUMENTATION-R.S KHANPUR.

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SEMESTER VI

Core Course (IN6B-14)

MICROCONTROLLERS

(72 Hrs- 4 Hrs/W-Credits 2)

Module I – Introduction to Microcontrollers

Introduction to Microcontrollers, Comparison between Microprocessors and microcontrollers, Functional block diagram, Pins and signals of 8051, Architecture of Intel 8051 in detail, Internal memory (ROM) organization. Important Registers .Internal RAM organization. Register banks ,Byte and bit addressable area. Flagsand flag register (PSW) .Program counter and data pointer . Stack and Stack pointer. Special Function Registers.

Module II – Instruction Set and Assembly language Programming

8051 Instruction Set, Classification of instructions, data transfer, arithmetic, logical, program branching, Boolean instructions. Addressing modes. External memory related instruction. Stack and subroutine. Call and return instructions. Push and Pop instructions. Delay generation. Programming examples

Module III – Counters/ Timers

Counter and Timer: Counter / Timer interrupts - Timing - Timer modes of operation - Counting.

Serial data input / Output: Serial data interrupt - Data transmission - Data reception - serial data transmission modes.

Interrupts: Timer flag interrupt - Serial port interrupt - External interrupt - reset - Interrupt control - Interrupt priority - Interrupt destination - Software generated interrupts.

Module IV- Interfacing and Applications

Interfacing of 8051 Microcontroller with Programmable peripheral Interface 8255, ADC, DAC, Interfacing of seven segment display, LCD module, keyboard interfacing, Stepper motor Interface. Application of microcontroller 8051 in measurement and control.

Books for Study:

1. The 8051 Microcontroller and Embedded Systems using Assembly and C Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay
2. The 8051 Microcontroller: Architecture, Programming and Applications –Kenneth J Ayala
3. Programming & customizing 8051 microcontroller -Myke Predko

4. Design with Microcontroller- John B. Peatman.
5. Design with PIC Microcontrollers – John B. Peatman
6. Microprocessors & Microcontrollers - A. Nagoor Kani- RBA Publications.

OPEN AND ELECTIVE COURSES UNDER BSc INSTRUMENTATION PROGRAMME

A-OPEN COURSES UNDER BSc INSTRUMENTATION PROGRAMME (Offered to students other than Instrumentation Stream)

Semester-5-Open Course-(IN5D-01)
ELEMENTS OF ENVIRONMENTAL SCIENCE
(36 Hrs- 2 Hrs/W-Credits 2)

Module I
Need and scope of Environmental education
Environment-Environment and man-Multidisciplinary nature of environmental studies-Environmental degradation-environmental management-environmental awareness-environmental education –Environment impact study.

Module II
Science of the environment
Lithosphere-Hydrosphere-Atmosphere-Biosphere- Sustainable and Unsustainable development.

Module III
Natural Resources (6 hrs)
Forest-Water-Mineral-Food-Energy-Land-conservation-role of individual in conservation of natural resources-Equitable use of resources for sustainable life style.

Module IV
Environmental pollution (Qualitative study) (10 hrs)
Water pollution-Air pollution-Noise pollution-Thermal pollution - Role of individual in the prevention of pollution.

Module V
Environmental Threats
Acid rain-Green house effect-Global warming-Ozone layer depletion-Photochemical smog-Eutrophication – Biomagnifications- Social issues.

Note: A study report on any local environmental issue is a compulsory component for Internal evaluation.

Books for Study and reference:
1.Elements ofenvironmental Science and Engineering P.Meenakshi PHI Pvt Ltd N.Delhi

2.Environmental Science- Principles and Practice R.S.Das,Behera PHI Pvt Ltd N.Delhi
3.Essential Environmental Studies S.P.Misra,S.N.Pandey Ane Books Pvt Ltd
4.Principles of Environmental Science &Engineering P.Venugopala Rao PHI Pvt Ltd N.Delhi.

Semester 5- Open Course –(IN5D02)

ENERGY RESOURCES AND UTILIZATION METHODS

(36 Hrs- 2 Hrs/W-Credits 2)

Unit I

Various forms of energy – renewable and conventional energy systems – comparison – coal, oil and natural gas – availability – applications – merits and demerits.

Unit 2

Solar energy - Solar radiation measurements, solar energy collector, principle of the conversion of solar radiation in to heat, Solar energy storage, solar heaters, space cooling, merits and demerits of solar energy.

Unit 3

Wind energy: Basic principle of wind energy conversion, basic components of wind energy conversion system, wind energy collectors. Energy storage, application of wind energy.

Unit 4

Biomass energy, classification, photosynthesis, biomass conversion process, merits and demerits of biomass as energy source.

Unit 5

Energy from Oceans and Chemical energy resources: Ocean thermal energy conversion, energy from waves and tides – basic ideas, nature, applications, merits and demerits.

Unit 6

Patterns of energy consumption in domestic, industrial, transportation and agricultural sectors – energy crisis and possible solutions — energy storage and hydrogen as a fuel (basics) – global warming.

Booksfor Study

1. Non – Conventional Energy Resources by G. D. Rai, Khanna Publishers, 2008.
2. Solar energy by G.D. Rai, 5th edition, 1995.
3. Solar Energy Fundamentals and application by H.P. Garg and J. Prakash, Tata McGraw- Hill Publishing company ltd, 1997.
4. Solar energy by S. P. Sukhatme, Tata McGraw- Hill Publishing company ltd, 1997.

Books for References

1. Energy Technology by S. Rao and Dr. B.B. Parulekar, 1997, 2nd edition
2.Power Plant Technology by A. K. Wahil. 1993.

Semester 5- Open Course (IN5D03)

SCIENCE OF EQUIPMENTS AND INSTRUMENTS IN MODERN LIFE

(36 Hrs- 2 Hrs/W-Credits 2).

Unit-1. Electric and Electronic Equipments-Qualitative study (18 hrs)

Electric motor – principles of working, Microwave oven – principle – technical specifications-applications – advantages, Public address system – Block diagram representation – function of each unit - CD player and drives – DVD player and drives – Telephonic communication (Cable and cellular) – Cell phone – SIM card - technical specifications

Unit 2. Scientific Instruments – (Working principle and applications) (12 hrs)

Tunnelling Electron Microscope (TEM) , Scanning Electron Microscope (SEM) , Atomic Force Microscope (AFM) - XRD – Spectrophotometer .

Unit 3. Medical Instruments (12 hrs)

CT Scan – basic principle – applications & advantages, MRI Scan – principle and applications & advantages – X ray - applications & advantages, Echo Cardio Gram (ECG), Ultra sound scan.

Unit 4. Optical Instruments (12 hrs)

Microscope, Electron microscope, Camera – History of evolution of camera – Digital camera, Optical communication net work- building blocks – Over head Projector (OHP), LCD Projector.

Books for study and references

1. Audio and video Systems. R.G.Gupta, Technical Education Series.
2. Mobile Satellite Communication Network (Ch 1 & 2), Ray E Sherrif & Y.Funttu, Wiley India Edn.
3. Television Engineering & Video System, R.G.Gupta, TMH.
4. Electrical Technology (Vol I & II), B.L.Theraja.
5. Physical principles of electron microscopy- An introduction to TEM, SEM, AFM, Springer, 2005.

B-ELECTIVE COURSES UNDER BSc INSTRUMENTATION PROGRAMME

(Offered to students of Instrumentation Stream)

Semester 6- Elective Course (IN6B-15a)

Power Plant Instrumentation

(72 Hrs- 4 Hrs/W- Credit 3).

Module I

Introduction to power plant processes. Types of fuels and fuel processing. Rankine and brayton cycles. Boilers-watertube, oncethrough and fluidised types. Types of condensors, steam turbines, cooling water system. Types of hydroturbines, gas turbines, combined cycle power plant. Power generating and distributing systems.

Introduction to nuclear reactor-PWR/BWR/FBR/GCR. Pollution from power plants.

Module II

Measurement and analysis in power plant- Flow measurements- feedwater, fuel flow, and airflow. Correction for temperature and pressure measurements.

Level measurements, smoke density measurements, pH meter, conductivity meter, TDS meter, Flame scanners. Measurements of silica, Dissolved oxygen. Need of blowdown.

Reading and drawing of instrumentation diagrams. Flow sheet symbols-ANSI symbols for 1) lines,2) Valves, 3) heat transfer, 4) dryer, 5) material handling equipment, 6)storage vessel, 7)turbine/compressor, 8)flowsheet codes and lines, 9)graphical symbols for pipe fittings, valves and piping. Instrumentation symbols, standards, specifications-one line diagram of typical measurement and control schemes for flow, temperature, pressure and other process variables. One line diagram of typical pneumatic, hydraulic & electrical instrumentation systems.

Module III

Combustion control – Main pressure air/fuel ratio, furnace draft and excess air control. Drum level control- two element and three-element control. Main and reheat steam temperature control, burner tilting, and bypass damper, super heater, spray and gas recirculation control. BFP recirculation control. Hot well and dearator level control, interlocks- MFT turbine trip control. Turbine monitoring and control. Automatic turbine runs up systems. Condenser vaccum control-, Speed , vibration, shell temperature monitoring .

Books for Study and reference

1.CEGB Engineers , *Modern PowerStation practice*, Volume6, Pergamon

2.H.P. Kallen, *Handbook of Instrumentation and Controls*, McGrawHill

3.Andrews and williams , *Applied instrumentation in process industries*,
Gulf Publishing Company

4.Mcculough.C.R, *Safety aspects of Nuclear reactors*. Van Nostrand, NY 5.B.G.Liptak, *Instrumentation in process industries*. Chilton book co.

6.David Lindesnev, *Boiler control Systems*,. McGrow Hill International.

7.D.M.Considine & S.P.Ross, *Hand/Book of Applied Instumentataion*., McGraw Hill

8.Samuel Glasstone, *Principles of Nuclear reactor Engineering*, Van Nostrand ,NY.

Semester 6- Elective Course (IN6B-15b)

INSTRUMENTS-PRINCIPLES AND APPLICATIONS

72 Hrs -4Hrs/W - Credit 3.

Unit-1. Electric and Electronic Equipments

Electric motor – principles of working, Microwave oven – principle – technical specifications-applications – advantages, Public address system – Block diagram representation – function of each unit - CD player and drives – DVD player and drives – Telephonic communication (Cable and cellular) – Principles (qualitative using block diagrams) – Cell phone – SIM card - technical specifications – Radio – History of radio revolution – different types of radios – Television – working (qualitative) – Touch screens & ATM (Automatic Telling machine).

Unit 2. Scientific Instruments

Tunneling Electron Microscope (TEM) – What is it – working principle- schematic representation – applications - technical specifications, Scanning Electron Microscope (SEM) - What is it – working principle- schematic representation – applications - technical specifications, Atomic Force Microscope (AFM) - What is it – working principle- schematic representation – applications - technical specifications, XRD – Principle and applications – Spectrophotometer working and applications – Scanning Tunneling Microscope.

Unit 3. Medical Instruments

CT Scan – basic principle – applications & advantages, MRI Scan – principle and applications & advantages – X ray - applications & advantages, Echo Cardio Gram (ECG), Ultra sound scan.

Unit 4. Optical Instruments

Microscope, Electron microscope, Camera – History of evolution of camera – Digital camera, Holography, Optical communication net work- building blocks – Over head Projector (OHP), LCD Projector, OMR reader, radar.

Unit 5. Common Mechanical devices

Pumps – what is it – working – different types of pumps – Refrigerator – working principle-technical specifications – Heat engines- Automobile engines working (Qualitative description only) – Different types – Brakes – Different types of brakes.

Books for study and References

1. Audio and video Systems. R.G.Gupta, Technical Education Series.
2. Mobile Satellite Communication Network (Ch 1 & 2), Ray E Sherrif & Y.Funttu, Wiley India Edn.
3. Television Engineering & Video System, R.G.Gupta, TMH.
4. Electrical Technology (Vol I & II), B.L.Theraja.
5. A Text book of elements of Mech. Engg (page 105-114), S.Trynbaka Moorthy, I.K International Publishing house.
6. Physical principles of electron microscopy- An introduction to TEM, SEM, AFM, Springer, 2005.

Semester 6- Elective Course (IN6B-15C)

PROGRAMMABLE LOGIC CONTROLLERS AND SCADA

(72 Hrs -4Hrs/W - Credit 3)

UNIT I – INTRODUCTION TO PROGRAMMABLE LOGIC CONTROLLERS

Introdution to PLC systems -Functional block diagram – Architecture of PLC – INPUT/OUTPUT Devices – Mechanical switches - Proximity switches - Photoelectric sensors and switches – Encoders- Temperature sensors- Position/displacement sensors- Strain gauges - Pressure sensors - Liquid level detector- Fluid flow measurement- Smart sensors. Output devices – Relay- Directional control valves- Motors - Stepper motors .

UNIT II – LADDER AND FUNCTIONAL BLOCK PROGRAMMING

Ladder diagrams –PLC Ladder Programming, Logic functions, JUMP and CALL instructions, Latching - Multiple outputs - Entering programs - Function blocks - Program examples

UNIT II – RELAYS, TIMERS & COUNTERS

Internal relays - Battery-backed relays - One-shot operation - Set and reset - Master control relay- - Types of timers - Programming timers - Off-delay timers - Pulse timers.
Forms of counter – Programming - Up and down counting - Timers with counters – Sequencer - Programming examples

UNIT IV – PLC APPLICATIONS AND SCADA

Application of Programmable Logic Controllers in Temperature control, Valve sequencing, Conveyor belt control, Control of a process.

Introduction to SCADA System: Definition of SCADA – elements of SCADA system – Communication in SCADA – applications.

TEXT BOOKS

1. Bolton. W, *"Programmable Logic Controllers"* Fifth Edition,2009.
2. B.G.Liptak, *Process Software and Digital Networks*, CRC Press
3. Frank Petruzella. D, *"Programmable Logic Controllers"*, Tata McGraw Hill Third Edition, 2010.
4. Programmable Logic Controllers – Principles and applications by John W Webb & Ronald A Reiss, fifth edition, PHI
5. Programmable Logic Controllers – Programming methods and Applications - JR.Hackworth & F.D Hackworth Jr. – Pearson, 2004

BSc Instrumentation Programme

IN6B-16(P) - **MICROPROCESSOR & MICROCONTROLLER LAB**

List of experiments

MICROPROCESSOR- 8085 (At least 10 experiments).

1. Add two eight bit numbers stored in consecutive memory locations to get a 16 bit result.

2.Subtract one 16 bit number from another 16 bit, stored in consecutive memory locations to get a 16 bit result.

3.Add n 8 bit binary numbers to get a 16 bit result.

4.Add n 8 bit BCD numbers to get a BCD 16 bit result.

5.Multiply one 8 bit number by another 8 bit number to get 16 bit result by successive addition.

6.Multiply one 8 bit number by another 8 bit number to get 16 bit result by bit rotation method.

7.Divide one 8 bit number by another 8 bit number to get 8 bit result.

8.Find the largest number from an array of 8 bit numbers stored in consecutive memory locations.

9. Find the smallest number from an array of 8 bit numbers stored in consecutive memory locations.

10. Find the numbers of ones in a given 8 bit number.

11.Sort an array of 8 bit numbers in ascending or descending order using bubble sort.

12.Copy an array of 8 bit numbers from one memory block to another.

13. Square wave generator.

14. Interfacing with Stepper Motor.

Micro Controller – 8051 (At least 6 experiments).

1. Addition – 8 bit, 16 bit.
2. Subtraction – 8 bit, 16 bit.
3. Multiplication
4. Array addition (multibyte)
5. Logical Operations – AND, OR, NOT

6. Decimal to Hexa and Hexa to Decimal.
7. Ascending Order.
8. Descending Order
9. Up/down Counter
10. Block data transfer
11. Interfacing with LCD
12. Interfacing with ADC/DAC
13. Square wave generator
14. Interfacing with Stepper Motor.
15. Interfacing with Traffic Light control system.

BSc Instrumentation Programme

IN6B-17(P) - **INSTRUMENTATION & PROCESS CONTROL LAB**

List of experiments

INSTRUMENTATION & PROCESS CONTROL LAB (At least any 12).

1.Dead weight pressure gauge.

Aim: To test the given pressure gauge using dead weight pressure gauge tester and plot the error graph

2.Second Order rotation system

Aim: To plot the time response of the given second order rotational system and to determine the characteristics

3.Study of the sensitivity of the unbalanced Wheatstone's Bridge

Aim: a. To find out the unknown value of resistances using a Wheatstone bridge.
b. To plot the variation of unbalanced output voltage with resistance changes for equal resistance variations for quarter Bridge and half bridge. 2. To calculate the sensitivity of the bridge by shunt calibration method.

4.Cup Anemometer

Aim: To familiarize operation and determination speed of wind

5.Falling ball Viscometer

Aim: To determine the viscosity of the given fluid using Stokes method.

6.Searle's Rotational Viscometer

Aim: To find the viscosity of the given fluid using Searle's Rotational Viscometer

7. Red Wood Viscometer

Aim: To find the viscosity of the given fluid using Red Wood Viscometer.

8. Characteristics of RTD

Aim: a. To study temperature Vs resistance characteristics of RTD.

b. To study temperature Vs output voltage characteristics and determine the time constant of the RTD.

9. Characteristics of thermocouple

Aim: a. To find the temperature Vs. output voltage characteristics of the given thermocouple and determine the time constant of the thermocouple.

b.Study the characteristics of thermocouple with and without compensation.

10.LDR Characteristics

Aim: a. To study the response of Distance versus voltage in LDR.
b. To study the response of Distance versus Resistance in LDR.

11. Photodiode Characteristics

Aim: To study the response of Distance versus voltage in Photodiode.

12. Phototransistor Characteristics

Aim: To study the response of Distance versus voltage in Phototransistor

13.Characteristics of thermistor

Aim: a. To study the temperature - resistance characteristics of a thermistor .
b. To study the temperature – voltage characteristics of a thermistor .

14. Pyrometer (Radiation / Optical)

Aim: a. To measure the temperature of the heater element using optical pyrometer
b. To plot the variation of temperature with power dissipation

15. Characteristics of LVDT

Aim: a.To plot the calibration curve for the given LVDT and to determine the static Sensitivity.

b. To study the characteristics of an LVDT position sensor with respect to the secondary output voltage.

16. Strain Measurement System:

Aim: a.To study the characteristics between strain applied to the cantilever beam strain sensor and the bridge voltage

b. To study the characteristics between strain applied to the cantilever beam strain sensor and the signal conditioned sensor output voltage.

17. Study the characteristics and control action of ON/OFF, P/PI/PID on different types of Process stations.

a) Temperature Process Control trainer

b) Level process control Trainer

c) Pressure process control trainer

d) Flow process control trainer

18. Characteristics of devices connected with process control systems

a) Characteristics of signal conditioner
b) Characteristics of RF capacitance type level sensor
c) Characteristics of I/P and P/I converters
d) Characteristics of Pneumatic control valve.

19. Tuning of PID controller

Aim: To determine the controller settings of a given process using any one of the popular tuning techniques.

20. PLC programming and implementation : PLC based Water level or Bottle filling or Motor speed control systems.

CURRICULUM FOR B.Sc. COMPUTER SCIENCE

(COMPLEMENTARY)

(2017-18 ACADEMIC YEAR ONWARDS – AS PER THE CUCBCSSUG 2014 REGULATIONS)

Total Courses: 5	Total Credits: 12

Semester	Course No	Course Code	Course Title	Marks			Contact Hours			Credits
				Intern	Extern	Total	Theor	Lab	Total	
1	1	CSC1C01	Computer Fundamentals	16	64	80	2	2	4	3
II	2	CSC2C02	Fundamentals of System Software, Networks and DBMS	16	64	80	2	2	4	3
III	3	CSC3C03	Problem solving using C programming	16	64	80	3	2	5	2
IV	4	CSC4C04	Data Structures Using C programming	16	64	80	3	2	5	2
IV	5	CSC4C05	Programming Lab: C and Data Structures	16	64	80	0	0	0	2
Total (5 Courses)						400				12

CSC1C01 – Computer Fundamentals

Semester:1
Course Number: 1
Contact Hours:2T+2L
Number of Credits:3
Number of Contact Hours:60
Course Evaluation: Internal – 16 Marks + External – 64 Marks

Objectives of the Course:

To learn the basics of computer hardware units and how they work together
To acquire basic skill with office packages

Prerequisites:

Background of the basic science at +2 level

Course Outline

UNIT I (6T+6L)

Number systems- Non-positional number systems and positional number systems (Binary, Octal and Hexadecimal), Converting from one number system to another- decimal to a new base, converting to decimal from another bases, converting from base other than ten to base other than ten, short cut method for converting from binary to octal, octal to binary, binary to hexadecimal and hexadecimal to binary, Computer Codes (BCD, EBCDIC, ASCII) error detecting and correcting codes, parity bit, Hamming Code, computer arithmetic ,importance of binary, binary addition and subtraction.

UNIT II (6T+6L)

Boolean Algebra and Logic circuits- fundamental concepts of Boolean Algebra, postulates, Principle of duality, theorems of Boolean Algebra, Boolean functions, minimization, complement, canonicals forms, conversion between canonical forms. Logic Gates- AND, OR, NOT, NAND, NOR, XOR and XNOR, logic circuits, converting expression to logic circuit, universal NAND and NOR gates, Exclusive OR and equivalence functions, Design of Combinational circuits (Half Adder, Subtractor and Full Adder)

UNIT III (6T+6L)

Basic Computer Organization-Input Unit, Output Unit, Storage Unit (Direct, Sequential and Random Access), CPU organization, Control Unit (micro programmed and hardwired control),

primary storage, memory hierarchy, storage locations and addresses, storage capacity, bit, byte, nibble, RAM, ROM, PROM and EPROM, cache memory, registers. Secondary storage devices (Magnetic tape, Hard disk and CD drive)

UNIT IV (6T+6L)

I/O devices - Input Devices-identification and its use, keyboard, pointing devices (mouse, touch pad and track ball), Video digitizer, remote control, joystick, magnetic stripes, scanner, digital camera, microphone, sensor, and MIDI instruments, Output Devices identification and its use, monitor, printer (laser, inkjet, dot-matrix), plotter, speaker, control devices (lights, buzzers, robotic arms, and motors)

UNIT V (6T+6L)

Planning a Computer program, purpose of program planning, algorithm, flowchart - symbols, sample flowcharts, advantages and limitations

References:

1. Pradeep K. Sinha and Priti Sinha, Computer Fundamentals, BPB
2. Peter Nortorn, Introduction to Computer, TMH
3. Rajaraman, V, Fundamental of Computers, Prentice Hall India
4. B. Ram, Computer Fundamentals

Lab List

Word Processing

- Paragraph formatting
- Newspaper style Document
- Table creation
- Mail merge
- Page formatting & printing

Spreadsheet

- Worksheet entries, including formulas
- Formatting cells
- Chart creation
- Functions

Presentation Software

- Creating presentation
- Animations
- Sound
- Inserting picture

CSC3C02 – Fundamentals of System Software, Networks and DBMS

Semester: 2
Course Number: 2
Contact Hours: 2T+2L
Number of Credits: 3
Number of Contact Hours: 60
Course Evaluation: Internal – 16 Marks + External – 64 Marks

Objectives of the Course:

To learn the basic concepts of various system software
To learn the basics of Computer Networks
To learn the basics of Databases

Prerequisites:

Background of the basic science at +2 level

Course Outline

UNIT I [6 T+6 L]

System software - classification of programming languages (Machine, assembly & High level), Characteristics and Comparison, language processors (Assembler, Interpreter and Compiler), Operating Systems- Functions, types of OS (batch, multiprogramming, time sharing, real time and distributed)

UNIT II [6 T+6 L)

Computer networks- goals of networking, network topologies, types of networks (LAN, MAN and WAN), network model, OSI model- 7 layers, Internet Layer- 5 layers, Communication Media-Guided (Twisted Pair, Coaxial Cable and Fiber Optic) and Unguided (microwave, satellite)

UNIT III [6 T+6 L]

Database Management Systems-definition, structure of Database, data models (Record based Data model, Network model: - Basic Components, Record types, data types, links, relationships,Hierarchical model and Relational model)

UNIT IV [6 T+6 L]

Structured query language - Create, insert, select, update, delete, alter, drop commands

UNIT V [6 T+6 L]

HTML-hypertext, hyper media, understanding basic HTML tools- HTML editor, web browser, General structure of HTML document, different types of elements-doc type, comment element, structural element, HTML tags and attributes: <html>, <body>, <head>,
<title>, <h1>,... ,<h6>,
, <table>, <img>, <hr>, adding links, background image to the body, creating lists.

References:

1. P. K Sinha, Fundamentals of Computers
2. D. M Dhamdhere, Operating System: A concept based Approach
3. Behrouz A Forouzan, Data Communication & Networking, MC Graw Hill
4. Joel Sklar,Principles of Web Page Design, Vikas Publications

Lab List

HTML

1. Simple HTML document creation
2. HTML document with tables
3. HTML document with various lists
4. HTML document with links to different parts of the same
5. documents and to separate documents

MySQL

1. Table creation
2. Data insertion and deletion
3. Data retrieval
4. Alteration of tables

CSC2C03 – Problem Solving Using C programming

Semester: 3
Course Number: 3
Contact Hours: 3T+2L
Number of Credits: 2
Number of Contact Hours: 75 Hrs.
Course Evaluation: Internal – Internal – 16 Marks + External – 64 Marks

Objectives of the Course:

- To learn the concepts of programming.
- To learn the C language

Prerequisites:

- Background of the basic science at +2 level

Course Outline

UNIT I [9 T+6 L]

Introduction to C- Structure of C program, Character Set, Keywords, Identifiers, Data Types, Qualifiers, Variables, Declarations, Symbolic Constants, Expressions, Statements, Different Types of Operators (Arithmetic, Logical, Relational & Equality, Unary and Conditional), Operator Precedence and Associativity, Library Functions, Comments, I/O functions-(Formatted scanf() & printf(), getchar (), putchar (), getche(), gets(), puts())

UNIT II [9 T+6 L]

Control Statements- Selection Statements (if, if-else, else if ladder, switch), iteration (while, do while, for), jumping (goto, break, continue), Nested Control Statements

UNIT III [9 T+6 L]

Structured Data types - Arrays (One dimensional and Two Dimensional), Character and String Functions, Structure (Definition, Processing-period Operator), Union

UNIT IV [9 T+6 L]

User defined Functions - Advantages, Definition, Accessing functions, formal and Actual Parameters, Recursion, Storage Classes- Automatic, External, Static and Register Variable, Argument Passing Mechanism

UNIT V [10 T+6 L]

Pointers and data files- Pointers, advantages, declaration, operations on pointers, pointers and one dimensional arrays, dynamic memory allocation. Data files (sequential), file handling functions (fopen(), fclose(), fputc(), fgetc(), fgets(), fputs(), fscanf(), fprintf()

References:

1. E Balagurusamy, *Programming in Ansi C*, Tata McGraw Hill
2. Byran Gotfried, *Programming with C*, Schaum Series
3. Kezningham & Ritchie, *Programming in C*
4. Yashvant Kanetkar, *Let us C*, BPB publications
5. Mullish Cooper, *The spirit of C*, Jasco books
6. Herbert Schildt, *The Complete reference C*, Tata Mc Graw Hill

CSC4C04 – Data Structure Using C programming

Semester: **4**

CourseNumber: 4

ContactHoursperWeek: **5**(3T+ 2L)

NumberofCredits: **2**

NumberofContactHours: 75 Hrs.

CourseEvaluation: Internal – 16 Marks+External – 64 Marks

Objective of the course

- Tointroducetheconceptofdatastructures
- Tomakethestudentsawareofvariousdatastructures
- Toequipthestudentsimplementfundamentaldatastructures

Prerequisites

- KnowledgeinCProgrammingLanguage

CourseOutline

Module I [10 T+6L]

Primitive Data types & Abstract Data Types(ADT) - Introduction to data structures – definition - characteristics of data structures - categories of data structures – algorithm - space complexity and time complexity of an algorithm.

Module II [6 T+6L]

Arrays & Singly Linked Lists - 1D, 2D and Multi-dimensional arrays – operations on arrays - Sparse matrix Representation

Module III [9 T+6L]

Lists- Linked List- Definition –Creation- Operations ,Basics of Doubly Linked List, Circular Linked List, Header Linked List

Module IV [11 T+6L]

Stack & Queues – Definition & Operations on stack - Implementation of Stack using arrays and linked lists - Applications of Stacks - Polynomial Addition

Queues – Definition, Implementations of queue using arrays and linked lists – basics of Circular queue, Dequeue - Priority queues - Applications of queues.

Module V [10 T+6L]

Searching and Sorting: Searching: Linear search & Binary search. Sorting – Linear sort - Bubble sort - Selection sort - Insertion sort - Quick sort - Merge sort – Comparisons and implementations.

TEXT BOOKS

1. SeymourLipschutz, "DataStructures",TataMcGraw-HillPublishingCompanyLimited,Schaum'sOutlines,NewDelhi.
2. YedidyanLangsam,MosheJ.Augenstein,andAaronM.Tenenbaum, "DataStructuresUsingC",PearsonEducation.,NewDelhi.
3. HorowitzandSahani, "FundamentalsofdataStructures",GalgotiaPublicationPvt.Ltd.,NewDelhi.

REFERENCEBOOKS

1. Trembley, J.P. And Sorenson P.G., "An Introduction to Data Structures With Applications", Mcgraw- Hill International Student Edition, New York.
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Addison- Wesley, (An Imprint of Pearson Education), Mexico City.

CSC4C05 – Programming Lab: C and Data structure

Semester: 4

Course Number: 5

Number of Credits: 2

Course Evaluation: Internal – 16 Marks + External – 64 Marks

Objectives of the Course:

- To develop C Programming skills
- To make the students equipped to solve mathematical or scientific problems using C
- To learn how to implement various data structures.

Prerequisites:

- Background of the basic computing knowledge

Course Outline

LAB LIST

C programming

Write programs and draw flowchart to do the following

1. Find roots of a quadratic equation
2. Find the area and nature of a triangle
3. Find the sum of digits and reverse of a number
4. Find the factorial of a number
5. Find Sin(x)
6. Find Cos(x)
7. Display pyramid using '*'
8. Check for leap year
9. To display count of +ves, -ves and zeros in a set of N numbers
10. Find first n prime numbers
11. Find LCM and HCF of 2 numbers
12. To print Armstrong numbers within range
13. Evaluate the series $1 + x + x^2/2! + x^3/3! + \ldots. + x^n/n!$
14. Convert a decimal number to a new base
15. Find the decimal equivalent of a number(base other than 10)
16. Calculate percentage of marks obtained for N students appeared for examination in M subjects.
17. To calculate standard deviation of N numbers.
18. To merge two arrays
19. To find N^{th} Fibonacci number

20. To find row and column totals of a matrix
21. Matrix addition, multiplication and transpose
22. To find the trace of a square matrix
23. To sort n numbers
24. Find the strings end with a particular character
25. Find the number of words in a given sentence
26. To check whether given string is palindrome or not
27. Swapping of two numbers using function
28. Reverse a string using recursion
29. Find the number of vowels in a string
30. To find length of a string using pointer
31. To count the occurrence of a word in a sentence.
32. To generate mark list of N students in a class using array of structures.
33. To insert an element at the correct position in a sorted array
34. To store and read from a text file
35. Write odd and even numbers into two files

Data Structure Programming

1. Sort a given list of strings
2. Reverse a string using pointers.
3. Search an element in a 1-dimensional array
4. Search an element in a 2-dimensiolnal array
5. Implement Pascals Triangle using 2-dimensional array.
6. Merge two sorted array into one sorted array.
7. Search an element in the array using recursive binary search.
8. Implement sparse matrix
9. Implement polynomial using arrays
10. Implement singly linked list of integers.
11. Delete an element from a singly linked list
12. Implement a doubly linked list of integers
13. Implement a circular linked list.
14. Implement polynomial using linked list
15. Addition of 2 polynomials
16. Implement Stack using array
17. Implement Stack using linked list
18. Implement Queue using array
19. Implement Queue using linked list
20. Implement linear sort
21. Implement bubble sort
22. Implement selection sort.

23. Implement insertion sort.
24. Implement quick sort.
25. Implement merge sort.

All lab works should be neatly recorded in a Laboratory Record Book in written form. However Program results can be pasted in the left hand side of the fare record. The laboratory record should have a minimum of:

- 20 lab exercises from C Programming
- 15 lab exercises from Data structure Programming

All students should maintain a rough record (observation note book) too, in which they write all the works to be carried out in the lab prior to his/her entry into the lab. He/She may also note down the i/p and o/p for program verification in the rough record.

COMPLEMENTARY II-Applied Physics
Semester I
Complementary II-Applied Physics
API1C-01 : Methodology of Science and Physics
(36 Hrs, 2 Hrs/w, 2 Credit)

Part A: Methodology And Perspectives Of Sciences (10Hours)

Unit I – Science and Science Studies

Types of knowledge: Practical, Theoretical, and Scientific knowledge, Information- What is Science; what is not science; laws of science. Basis for scientific laws and factual truths- Science as a human activity, scientific temper, empiricism, vocabulary of science, science disciplines- Revolution in science and Technology.

Unit II – Methods and tools of science

Hypothesis: Theories and laws in science. Observations, Evidences and proofs.
Posing a question; Formulation of hypothesis; Hypothetico-deductive model, Inductive model. Significance of verification (Proving), Corroboration and falsification (disproving),Auxiliary hypothesis, Ad-hoc hypothesis.
Revision of scientific theories and laws, Importance of models, Simulations and virtual testing, Mathematical methods vs. scientific methods. Significance of Peer Review.

Reference Books:

1. Gieryn, T F. Cultural Boundaries of Science., Univ. of Chicago Press, 1999
2. Collins H. and T Pinch., The Golem: What Everyone Should Know About Science., Cambridge Uni. Press, 1993
3. Hewitt, Paul G, Suzanne Lyons, John A. Suchocki & Jennifer Yeh, Conceptual Integrated Science. Addison-Wesley, 2007
4. Newton R G. The Truth of Science: New Delhi, 2nd edition
5. Bass, Joel E and et. al. Methods for Teaching Science as Inquiry, Allyn & Bacon, 2009

Part B: Methodology and Perspectives of Physics (12Hours)

(All topics in this part require qualitative study only, derivations are not required)
What does physics deal with? - Brief history of physics during the last century-the Inconsistency between experiments and theories-
Birth of new science concepts -Quantum concepts-Black body radiation, Photoelectric effect, X-rays, Compton effect, De Broglie waves, Sections 2.2, 2.3, 2.5, 2.7, 3.1, of Arthur Beisser)
Relativity-Special relativity, Time dilation, Length contraction, Twin paradox (Sections 1.1, 1.2, 1.4, 1.5 of Arthur Beisser)

Laser- Concepts of ordinary and monochromatic light, Coherent and incoherent light, Spontaneous and stimulated emission, Metastable state, pumping and population inversion.(Basic ideas only Section 4.9 of Arthur Beisser)
Design of an experiment , experimentation , Observation, data collection:
Interaction between physics and technology.

References:

1. Concepts of Modern physics- Arthur Beisser
2. A brief history and philosophy of Physics - Alan J. Slavin- http:/ www.trentu. Ca/academic / history- 895 .html
3. The inspiring History of Physics in the Last One Hundred Years : Retrospect and prospect Prof. Dr-lng . Lu Yongxiang http :// www.twas.org.cn/twas/proLu.asp

Part C – Mathematical Methods in Physics (14 Hours)

Vector Analysis: – Vector Operations - Vector Algebra – Component form – How vectors transform, Applications of vectors in Physics.
Differential Calculus: – The operator _ - Gradient, Divergence, Curl – Physical
Interpretation - Product rules of _ - Second derivatives.
Integral Calculus: – Line integral, surface integral and volume integral – Fundamental theorem of Gradients – Gauss's Divergence Theorem (Statement only)– The fundamental theorem of curl – Stoke's theorem(Statement only). Divergence less and curlless fields.
Curvilinear co-ordinates: – Spherical polar coordinates – cylindrical coordinates(Basic ideas).
Matrices: – Basic ideas of matrices – addition, subtraction, scalar multiplication, Transpose of a matrix, conjugate of a matrix, diagonal matrix - Representation of vectors as column matrix – Determinants – Cramer's rule – Eigen Values and Eigen Vectors – Hermitian Matrix, Unitary Matrix.

References:
1. Introduction to electrodynamics – David J . Griffiths, Prentice Hall India Pvt. Ltd., Chapter – 1
2. Mathematical Physics - Satya Prakash, Sultan Chand &Sons, New Delhi

*** For API1C-01 Syllabus see PHIB-01 of BSc Physics Programme**

SEMESTER 1- API1C-01 (L) - General Physics Lab (2Hrs/W)

LIST OF EXPERIMENTS

(6 Experiments out of 8)

1.Spectrometer - angle and minimum deviation of solid prism.

2.Newtons rings- Wave length of the monochromatic light.

3.Viscosity of the liquid: Capillary flow method

4.Carey Fosters Bridge: - temperature coefficient of resistance of the material of the given wire.

5. Potentiometer:- Calibration of a low range voltmeter.

6.Deflection magnetometer:- moment and pole strength of a bar magnet, Tan C method

7.Rigidity modulus of the material of a wire:- Torsional oscillation method.

8.Current sensitivity of a moving coil galvanometer.

SEMESTER II

API2C-02 BASIC ELECTRONIC DEVICES AND CIRCUITS
(36 Hrs , 2 Hrs/w, 2Credit)

Unit 1. (18 hrs)

1.Semiconductor Physics:- Semiconductors, Bonds in Semiconductors, Semi conductor material (Silicon and Germanium), Energy Band description, effect of temperature, Hole current, intrinsic and extrinsic – p-type and n-type semiconductors

2.Junction diode: - pn junction, Properties of pn junction- Forward and reverse biasing. V-I characteristics of PN junction diodes, Diode as a rectifier, Zener diode, Half wave, full wave and bridge rectifier circuits, Efficiency, Nature of output ripple factor, filter circuits, capacitor filter, π filters, voltage stabilization using Zener diode. Voltage multiplier.

3. Transistors :- BJT fundamentals, Types of BJT (NPN and PNP), BJT operation, BJT configuration and characteristics- CE, CB, CC. Transistor as an amplifier, current amplification factors, their relationships, transistor biasing, need for biasing, different types of biasing , collector to base bias, biasing with emitter resistor, fixed bias, voltage divider bias. Single stage transistor amplifier circuit, Input and Output resistances, Voltage and current gains.

Unit 2 (18 hrs)

4. Multistage amplifiers: - RC coupled amplifiers. Frequency response and gain in decibels, Classification of power amplifiers, class A, Class B and Class C

5. Filed effect transistor:- Basic construction of JFET, JFET characteristics and parameters (V_{DS}, Pinch-off voltage etc.), Common source amplifier.

6. Feed back circuits and oscillators: Basic principle of feed back, positive and negative feed back, basic type of negative feedback circuits, feed back and circuit requirement for oscillators. LC and RC oscillators, tuned collector oscillator, Hartley oscillator, Phase shift oscillator, crystal oscillator expression for frequency.

7. Modulation and demodulation: - Transmission and reception of radio waves, types of modulation, AM FM, their comparison, and demodulation- linear diode demodulation for AM signals.

8. Special devices: - LED, UJT, MOSFET, SCR

Text books:

1. Principles of electronics, V K Metha and Rohit Metha, S Chand & Comp., New Delhi
2. Basic Electronics, Solid state, B L thereja
3. Electronic Principles- Devices and circuits M L Anand.

References:

1. Electronic Principles, Albert Paul Malvino
2. Semiconductor Electronics, R K Sharma
3. Physics of semiconductor devices, Michel Shur.

SEMESTER II - API2C-02(L) –BASIC ELECTRONICS LAB (36 Hrs ,2 Hrs/w)
LIST OF EXPERIMENTS

(Minimum 6 Experiments out of 8)

1. Construction of Full wave rectifiers
2. Construction of Zener Voltage regulator.
3. Construction of Transistorized power supply
4. Single stage CE Transistor Amplifier-Gain.
5. CE Transistor Amplifier-Frequency response
6. Colpitt's Oscillator
7. RC Phase shift Oscillator
8. Astable Multivibrator

SEMESTER III

API3C-03 -OP-AMP AND APPLICATIONS

(54 Hrs ,3 Hrs/w , 2 Credits)

Unit 1 (27 Hrs)

Op-amp parameters, ideal op-amp, open loop op-amp configuration-differential amplifier, inverting amplifier, non inverting amplifier, equivalent circuit of an op-amp.
Op-amp linear application-dc amplifier, ac amplifier, summing amplifier, scaling amplifier, averaging amplifier, precision rectifier, instrumentation amplifier, integrator, differentiator.

Unit 2 (27 Hrs)

Active filters-low pass high pass, band reject, all pass filter.
Wave form generators-square wave,triangular,saw tooth, voltage controlled oscillator
Comparators-basic comparator types,characteristics,applications,zero crossing detector, schimitt trigger,voltage limiters.

Text book:

Opamps and linear integated circuits- E.A.Gayakwad, Prentice Hall India, New Delhi.

Additional references :

1.Operational amplifiers and applications-Subirkumar Sarkar, S. Chand & Co.

2.Operational Amplifiers and Linear Integrated circuits, Robert F. Coughlin and Frederick F. Driscoll , Prentice Hall India, New Delhi

3.Digital principles and applications-Malvino and Leach 4th edn TMH

4.Digital fundamentals-Thomas L Fioyd, Merril Publishing Co, US

SEMESTER III - API3C-03(L) –OP-AMP LAB (36 Hrs ,2 Hrs/w)

LIST OF EXPERIMENTS

(Minimum 6 Experiments out of 8)

1.Inverting amplifier,

2.Non inverting amplifier

3.Summing amplifier

4.Voltage Follower

5.Astable Multi vibrator

6.Integrator

7.Differentiator

8.Phase shift oscillator

SEMESTER IV
API4C-04 -DIGITAL INTEGRATED CIRCUITS
(54 Hrs , 3 Hrs/w , 2 Credit)

LOGIC CIRCUITS: (10Hrs)

Functions of Binary Variables – Logic Gate operations – Logic Variables – Boolean algebraic theorems – Binary number systems – Arithmetic operations – Standard form of Logic functions –

SOP & POS – Minterm and Maxterm specifications – Karnugh map representations – simplifications – uses.

LOGIC FAMILIES: (8 HRS)
Concepts of different logic families – TTL – active pull up – Volt- Ampere characteristics of TTL gates – Manufacture's specifications – Types of TTL gates – Schotkey TTL, ECL gates – Transfer Characteristics – properties – Logic versatility.
MOS gates: Characteristics – CMOS gates – Manufacture's specifications – Interfacing BJT and CMOS – Types of CMOS gates.

FLIP-FLOPS: (8 HrS)
Terminology – Flip-flop as a Memory element – Different types, Characteristics –propagation delay – Manufacture's specifications – Applications – Latches.

REGISTERS & COUNTERS: (1O HRS)
Shift Register – Serial – Parallel Data Transfer –Typical Circuits- Applications –Ripple counters – Methods to improve counter speed – Counter designs – Synchronous & Asynchronous counter – Sequence generator –typical circuits – Principle of operation – applications – IC versions.

LOGIC FUNCTIONS: (10 HRS)
Adders –different types – Comparators – Decoders – Encoders – Code converts – Multiplexers – Demultiplexers – Parity generators – Familiarization of popular IC versions –Typical circuits applications.

SYSTEM INTERFACING: (8 HRS)
Analog to Digital converter - Digital to Analog converter – different types –applications – popular IC versions.

TEXT BOOKS:
1. Digital Fundamentals – Thomas Floyd.
2. System Design using ICs – B.S. Sonde.

REFERENCE BOOKS:
1. Digital Integrated Electronics – Taub & Schilling.
2. Microelectronics – Millman & Grabel.

SEMESTER IV - API4C-04(L) –DIGITAL ELECTRONICS LAB (36 Hrs ,2 Hrs/w)

LIST OF EXPERIMENTS

(Minimum 6 Experiments out of 8)

1. Realization of gates using NAND & NOR.

2. Half Adder using NAND & NOR.
3. Full Adder using NAND & NOR.
4. Flip Flops – RS, Clocked RS, D, T, JK.
5. Verification of De Morgans Theore
6. Counters (Up/Down/Decade).
7. D/A Converter.
8. A/D Converter.

MODEL QUESTION PAPER

UNIVERSITY OF CALICUT.

CUCBCSS UG 2014-Scheme

Core Courses

FIRST SEMESTER

Core Course (IN1B-01)

Time: 3 Hrs **APPLIED MATHEMATICS I** **Max: 80 Marks**

SECTION A: Objective type questions. Answer all questions. (One Mark each)

1. $\lim_{x\to 2} \frac{4x^2 - 8x}{x - 2}$ is …….. (a) 1 (b) 2 (c) 4 (d) 8

2. $\lim_{x\to 0} \frac{1}{x} \cdot \sin(x)$ is …….. (a) 1 (b) 2 (c) 4 (d) 8

3. A line that just touches a curve at one point, without cutting across it is called ……

4. Evaluate $\int_0^{\pi} (1+\cos x)\, dx$. (a) 0 (b) $\pi/4$ (c) π (d) $\pi/2$.

5. $\lim_{x \to 1} \left\{ \frac{1 - x}{\log x} \right\}$ (a) 1 (b) -1 (c) 0 (d) 4

6. The average rate of change of 'f ' in the interval joining x_0 to $x_0 + h$ is ……

7. $\lim_{x \to -\infty} \frac{3x + 7}{x^2 - 2}$ (a) 1 (b) -1 (c) 0 (d) 4

8. Evaluate $\int_0^{\pi/3} 4\sec\theta \tan\theta \, d\theta$ is …… (a) 0 (b) 4 (c) 1 (d) 2

9. The function $f(x) = \frac{|x|}{x}$ is not continuous at x =

10. $\lim_{x \to \infty} \frac{2x^3 + 7}{x^3 - x^2 + x + 7}$ =

SECTION B- Short answer type questions.(one or two Sentences each) Answer any TEN questions. (2 marks)

11. Explain Removable discontinuity.

12. Is there a real number that is one less than its fifth power?

13. Show that the function $f(x) = x^2$ is differentiable for all values of x in its domain. Find the derivative.

14. Find an equation for the tangent to the curve $y = x + 2/x$ at the point (1,3).

15. Discuss about left hand and right hand derivatives.

16. State Mean Value Theorem.

17. State Rolle's Theorem.

18. Evaluate (a) $\lim_{x \to 0} \frac{x - \sin x}{x^3}$

19. Evaluate $\int_1^3 (3x^2 + x - 5)\, dx$.

20. Evaluate $\lim_{x \to 0^+} x \cot x$.

21. Evaluate $\int_0^2 (2t-3)\, dt$.

22. Differentiate the function $y = x^7 + \sqrt{7} - \frac{1}{\pi + 7}$ with respect to x.

SECTION C- (Paragraph type questions. (Five marks each) (Answer any SIX questions).

23. Find the derivative of the following function at x = -1. $f(x) = \frac{1}{x+2}$

24. An Object is dropped from the top of a 100 m high tower. Its height above ground after t seconds is $100 - 4.9\, t^{2.}$ How fast is it falling 2 sec after it is dropped?

25. Verify Mean Value theorem and find 'C' for f(x) = x(x-1)(x-2) for a=0, b = ½.

26. For What values of a is $f(x) = \begin{cases} x^2 - 1, & x < 3 \\ 2ax, & x \geq 3 \end{cases}$ is continuous at every x.

27. Find the differential equation of all straight lines touching the circle $x^2 + y^2 = a^2$.

28. Show that the equation $(1 + 4xy + 2y^2)\, dx + (1 + 4xy + 2x^2)\, dy = 0$ is Exact and hence solve it.

29. Find the orthogonal trajectories of the straight lines given the equation y = mx.

30. Find the area between the curves $y = \sec^2 x$ and $y = \sin x$ from 0 to $\pi/4$.

31. Evaluate (a) $\lim \frac{x^2 - 3x + 2}{}$ (b) $\lim \frac{x^2 - 3x + 2}{}$

$x \to 2^+$ $x^3 - 4x$ $x \to 2^-$ $x^3 - 4x$

SECTION D (Essay Type Questions. 10 Marks each). Answer any TWO question.

32. a) Find the slope of the parabola $y = x - 2x^2$, at the point (1,-1) . Write an equation for the tangent to the parabola at this point.

(b) Find equations of all lines having slope -1 that are tangent to the curve $y = \frac{1}{x-1}$

33. a) Find the length of the arc of the semi cubical parabola $y^2 = x^3$ extending from the origin to the point (1,1).

b) Find the area of the surface generated by revolving about the axis of x, the arc of the parabola $y^2 = 4ax$ from the origin to the point where x = a, a > 0.

34. Evaluate the following

a) Evaluate (a) $\lim_{x \to \pi/4} \frac{\sec^2 x - 2\tan x}{1 + \cos 4x}$ (b) $\lim_{x \to 0^+} (\cot x)^{\sin 2x}$

35. At time t, the position of the body moving along the s-axis is $s = t^3 - 6t^2 + 9t$. (a) Find body's acceleration at each time the velocity is zero. (b) Find the body's speed at each time the acceleration is zero. (c) Find the total distance travelled by the body from t = 0 to t = 2.

SECOND SEMESTER

CUCBCSS UG 2014-Scheme,

Time: 3 Hrs **Core Course (IN2B-02) APPLIED MATHEMATICS II**

Max: 80 Marks

SECTION A: Objective type questions. Answer all questions. (One Mark each)

1. L (0) is …….. (a) 1 (b) 0 (c) 4 (d) 8

2. L (1) is …….. (a) 1/s (b) 2s (c) 4s (d) 2/s

3. If A is impossible event , then P(A) = ...

4. If a sequence (a_n) has a finite limit it is called a _____ sequence.
(a) Convergent (b) Divergent (c) Bounded (d) Monotonic

5. L (t^n) is ……

6. The half range sine expansion of f(x) in (0, L) is ……

7. L ($e^{at} t^n$) = …….

8. L^{-1} (0) = …….

9. When A and B are mutually exclusive, then P (AUB) = ...

10. nC_0 = ...

SECTION B- Short answer type questions.(one or two Sentences each) Answer any TEN .(2 marks)

11. What is the Probability that a leap year selected at random will contain 53 Sundays?
12. Derive Laplace transform of the function t.
13. Define Fourier series of a periodic function.
14. Find the Laplace Transform of Sin 2t Sin 3t.
15. State Convolution Theorem.
16. State First Shifting Property of Laplace Transforms.
17. Test the convergence of the series $\sum_{n=1}^{\infty} \frac{2^n}{n^2}$

18. Let the average mark of 40 students of class A be 38, the average mark of 60 student of another class B is 42. What is the average mark of the combined group of 100 students.

19. Find the inverse Laplace transform of arc cot (s /2).

20. Find the Laplace transforms of $\sin^3 2t$.

21. Three groups of children contain respectively 3 girls and 1 boy, 2 girls and 2 boys, 1 girl and 3 boys. One child is selected at random from each group. Find the chance that the three selected comprise 1 girl and 2 boys.

22. Test the convergence of the series using Cauchy's root test:
$1/3+(2/5)^2 + (3/7)^3 +\ldots\ldots+(n/2n+1)^n +\ldots\ldots$

SECTION C- Paragraph type questions. (Five marks each) (Answer any SIX).

23. Derive a) L (Sin at) b) L (Sinh at).
24. Find the two half range expansions of the function $f(x) = x$, $0 < x < 2$.
25. Find the Laplace Transform of a) t Cos wt b) t^2 Sin wt
26. Find the Laplace Transform of $e^{-3t} \sin^2 t$.
27. A Problem in statistics is given to 3 students A,B and C whose chance of solving it are ½ , ¾ ,and ¼ respectively . What is the probability that the problem will be solved.

28. Find the Laplace Transform of $e^{-3t}[\ 2\cos 5t - 3\sin 5t]$.
29. Discuss about absolute and conditional convergence.
30. Obtain the Fourier series for $f(x) = \pi x$ in $[0, 2]$.

31. Find CV for the following data

Class:	0 – 6	6 – 12	12 – 18	18 – 24	24 – 36
F:	5	12	30	10	3

SECTION D (Essay Type Questions. 10 Marks each). Answer any TWO.

32. Find the Inverse Laplace Transform of

(a) $\dfrac{s^2 + 2s + 3}{(s^2 + 2s + 2)(s^2 + 2s + 5)}$ (b) $\dfrac{s^2}{(s^2 + w^2)^2}$

33. Obtain a Fourier series for the function $f(x) = e^{-x}$ in $(0, 2\pi)$.

34. Two urns I and II contain respectively 3 white and 2 black balls, 2 white and 4 black balls. One ball is transferred from urn I to urn II and then one is drawn from the latter, it happens to be white. What is the probability that the transferred ball was white?

35. Find the Mean, Median and mode from the following data.

Class:	0 – 5	5 – 10	10 – 15	15 – 20	20 – 25
F:	5	10	15	12	8

THIRD SEMESTER

CUCBCSS UG 2014-Scheme,

Core Course (IN3B-03) MEASUREMENT TECHNIQUES

Time: 3 Hrs **Max: 80**

Marks

SECTION A: Objective type questions. Answer all questions. (One Mark each).

1. The Unit of nuclear dose given to the patient is ..... (a) Fermi (b) Rutherford (c) Curic (d) Rontgen

2. In electrodynamic instruments the damping is invariably: (a) pneumatic (b) Electromagnetic (c) By fluid friction (d) by breaking magnet

3. X-Y recorders use chart form paper that rolls vertically. (True/False)

4. PMMC means.....
5. Kelvin bridge is a modified form of.....

6. Which of the following bridge used as a notch filter: (a) Maxwell bridge (b) Hay bridge (c) Schering bridge (d) Wien bridge.
7. A circular recorders uses a curvilinear chart paper. (True/False).
8. What type of damping is used in electrodynamic type instrument ?
9. The controlling element in a PMMC device is ..... (a) Magnet (b) Coil (c) Spring (d) deflection needle
10. The value of multiplier resistance must be ..... times the coil resistance, to increase the voltmeter range by a factor of 10.

SECTION B- Short answers type questions. (one or two Sentences each) Answer any TEN. (2 marks)

11. What are the functions of instrument and measurement system?
12. Explain the terms accuracy and precision?
13. How the temperature change is compensated in ammeter?
14. What are the static characteristics of measurement system?
15. Sketch the curves for the different types of damping?
16. Give the diagrammatic explanation for potentiometer method of calibrating a d.c. ammeter?
17. Give the circuit details of a shunt type ohm meter.
18. Explain what is meant by loading effect of an instrument.
19. Draw the circuit of a Wheatstone bridge and explain briefly the balancing condition.
20. Compare strip chart and circular chart recorders.
21. What are the advantages of Guarded Wheatstones bridge?
22. List the alternating current indicating instruments.

SECTION C- Paragraph type questions. (Five marks each) (Answer any SIX).

23. Explain steady-state response and transient response.
24. With the circuit explain the dc potentiometer.
25. How is the current range of PMMC instrument extended with the help of shunts

26. Draw and explain Kelvin's double bridge.
27. State the limitations of a galvanometer recorder and explain how it is eliminated?
28. Describe the operation of a digital X – Y recorder.
29. Discuss about data loggers.
30. Describe the operation of power factor meter with neat diagram.
31. The true value of a measured voltage is 1.5V. An analog voltage indicating instrument with a scale range of (0-2.5)V shows a voltage of 1.29V. Find the values of absolute error and absolute correction and express the error as a fraction of the true value and full scale division.

SECTION D (Essay Type Questions. 10 Marks each). Answer any TWO .

32. What are the different types of error in measurement system? Explain briefly.

33. Briefly explain different standards and their classification of measurement system.

34. Explain how inductance can be measured using Maxwell's bridge.

35. Discuss with necessary diagram the principle and working of electrodynamometer in power measurements.

Core Course (IN3B-04) TRANSDUCERS

Time: 3 Hrs **Max: 80 Marks**

SECTION A: Objective type questions. Answer all questions. (One Mark each)

1. A resistance potentiometer is a ..... order instrument.
2. Thermocouples are..... transducers. (a) Passive (b) active (c) both passive & active (d) output
3. Resolution of a transducer system means
   (a) Smallest measurable output change (b) smallest measurable input change
   (c) Largest measurable input change (d) None of the above
4. Chromal and ..... are the materials used for the construction of k – type thermocouples.
5. ..... is a measure of the repeatability of measurements.
6. Name a Piezoelectric transducer
7. Which order system is a thermistor?
8. ..... is an example of photo emissive cell.
9. The equation for the resistance- temperature relationship of a resistance thermometer is .....
10..... is a transducer which is used for the measurement of angular displacement .

SECTION B- Short answers type questions. (One or two Sentences each) Answer any TEN. (2 marks)

11. Explain why platinum is preferred for the fabrication of RTD.
12. List out the disadvantages of LVDT.
13. Write the salient features of Thermistor.
14. Write the advantages of electrical transducers.
15. Give details of an inverse transducer.
16. Briefly explain the working principles of a watt-hour meter.
17. Describe the working principle of the resistance type temperature sensors.
18. Citing example distinguish between the sensor and a transducer.
19. Briefly explain the principle of the operation of a condenser microphone.
20. What is null voltage?
21. Write the equation for the voltage output of a thermocouple.
22. What you meant by “Precision” of a measurement system.

SECTION C- Paragraph type questions. (Five marks each) (Answer any SIX).

23. Describe the different criterion for selection of transducers for an application.
24. Explain the operation of semiconductor strain gauge.

25. Describe the lead compensation in thermocouple.

26. A thermocouple system has a time constant of 10s. The system is used to measure the temperature of a furnace which fluctuates sinusoidally between 640°C and 600°C, with a periodic time of 80 seconds. Determine the maximum and minimum values of the temperature indicated. Calculate also the angle of phase shift and time lag.

27. Describe the constructional details and working principle of a photo voltaic cell.

28. Explain the principle and operation of resistance thermometer.

29. Briefly discuss the differences between photoelectric and photovoltaic transducers.

30. Show that a linear potentiometer used as a displacement transducer is a zero order system?

31. Describe the construction, principle of working of a Hall Effect transducer.

SECTION D (Essay Type Questions. 10 Marks each). Answer any TWO .

32. Explain different types of capacitive transducers.

33. Tabulate the different types of transducers and their principle of operation with application.

34. Explain the principle and construction of wire wound strain gauge and derive the expression for gauge factor.

35. Explain in detail static and dynamic characteristics of thermocouple.

FOURTH SEMESTER

CUCBCSS UG 2014-Scheme,

Core Course (IN4B-05) INDUSTRIAL INSTRUMENTATION I

Time: 3 Hrs **Max: 80**

Marks

SECTION A: Objective type questions. Answer all questions. (One Mark each)

1. RVDT used for displacement measurement is .....
   (a) an active transducer (b) a passive transducer (c) a capacitive transducer (d) digital transducer
2. Piezoelectric transducer cannot measure ..... pressure
3. A thermopile is often used as the ..... in a radiation pyrometer.

4. Connecting several thermocouples in series is called .....
   (a) thermistor (b) thermopile (c) thermocoil (d) none of these
5. In torque sensors, temperature sensor is not required . [True / False]
6. Two types of thermal flow meters are ..... and .....
7. Name the type of sensor used to measure torque by using the angular displacement between two sections of the rotating shaft.
8. Rotameter is a ..... flow meter.
9. What is the temperature range of Copper – Constantan thermocouple ?
10. Optical Pyrometer is used to measure .....

SECTION B- Short answers type questions. (One or two Sentences each) Answer any TEN. (2 marks)

11. What is a semiconductor strain gauge?
12. Name three types of thermocouples.
13. What is the dissipation constant of a thermistor?
14. State the disadvantages of RVDT.
15. State the principle of operation of proximity torque sensor.
16. Differentiate a.c tachometer from d.c tachometer.
17. What is meant by elastic force transducer ?
18. State the advantages of Bellows – type gauges.
19. What are the different types of thermal flow meters ?
20. Define Bellows.
21. What is meant by dead weight gauges?
22. What is a primary pressure standard?

SECTION C- Paragraph type questions. (Five marks each) (Answer any SIX).

23. Explain the operation of Venturi tube?
24. Explain the principle of magnetive strictive transducer
25. Explain the principle of operation of radiation pyrometer. What are the different sources of errors in them?
26. Compare the orifice plate and venture tube types of fluid flow meters.

27. Explain how temperature can be measured by optical pyrometer
28. What is piezo electric effect ? Mention its application. Name two piezo electric materials.
29. Explain the principle of operation of stroboscope?
30. Explain photoelectric tachometer.
31. Write short notes on Thermistors. Explain its advantages.

SECTION D (Essay Type Questions. 10 Marks each). Answer any TWO.

32. Explain with neat sketches the working of magnetostrictive transducers for torque measurement.

33. Explain the working of Magnetic – drag tachometer with suitable diagram?

34. With suitable diagram , explain the hot wire anemometer type flowmeter?

35. Explain in detail the inductive torque transducer with necessary diagram.

FOURTH SEMESTER

CUCBCSS UG 2014-Scheme,

Core Course (IN4B-06) ELECTRICAL & ELECTRONIC INSTRUMENTATION

Time: 3 Hrs **Max: 80**

Marks

SECTION A: Objective type questions. Answer all questions. (One Mark each)

1. Andersons bridge is a modification of ..... bridge.
   (a) Owen (b) Hay's (c) De Sauty (d) Maxwell - wein
2. The meter that is suitable for only direct current measurement is ...
   (a) moving –iron type (b) permanent magnet type (c) electrodynamic type (d) hot-wire type
3. Frequency dividers used in the frequency counter divide the frequency by ..... (a) 10 (b) 2 (c) 100 (d) 20

4. The superposition theorem is essentially based on the concept of
   (a) Duality (b) Linearity (c) Reciprocity (d) Non-linearity
5. A DC voltmeter may be used directly to measure ....
   (a) Frequency (b) Polarity (c) Power factor (d) Power
6. ..... technique used in sampling voltmeter .
7. Dual of Norton's theorem is .....
8. Unknown impedance can be measured using .....
9. The negative bias applied to the control grid in a CRT is used to control .....
10. Name the type of Oscilloscope used to analyse very high frequency signals.

SECTION B- Short answers type questions. (One or two Sentences each) Answer any TEN. (2 marks)

11. What is the use of Instrument Transformer ?
12. What is the disadvantage of Hay's Bridge
13. Draw series & shunt type ohmmeter
14. State compensation theorem
15. Draw Wien's series & parallel Bridge
16. List the components of CRT.
17. What is a Nano-Ammeter
18. State Norton's theorem
19. Write the principal of operation of Watt-hour meter
20. What is meant by Triggered Sweep in a CRO?
21. Explain the term Quantization error in a digital voltmeter.
22. Mention two applications of oscilloscope.

SECTION C- Paragraph type questions. (Five marks each) (Answer any SIX).

23. Derive the balanced condition of Maxwell's Inductance Bridge
24. Explain Q meter with diagram.
25. Write a note on Analog Frequency meter
26. Explain Dual Trace oscilloscope with a block diagram
27. Draw and explain DC voltmeter

28. Explain about Analog Phase meter.
29. Explain about Delta/Star transformation
30. Explain the dual trace operation in a CRO.
31. With the help of suitable diagram , explain the principle of a digital frequency meter.

SECTION D (Essay Type Questions. 10 Marks each). Answer any TWO.

32. Write the principle & operation of Hall effect & Thermal type watt meter

33. With relevant diagrams, explain the principle and working of a digital voltmeter.

34. Explain the measurement of inductance with Hay's bridge with suitable diagrams.

35. Explain : (a) Digital Storage Oscilloscope (b) Digital Phase meter. (c) Square wave generator

FIFTH SEMESTER

CUCBCSS UG 2014-Scheme,

Core Course (IN5B-07) INDUSTRIAL INSTRUMENTATION II

Time: 3 Hrs **Max: 80**

Marks

SECTION A: Objective type questions. Answer all questions. (One Mark each)

1. The Practical range of pH scale is .....
   (a) 0 and 16 (b) 0 and 8 (c) 0 and 14 (d) none of these
2. Balance type densitometers are suitable for density measurements of
   (a) Liquids and gases (b) Gases only (c) Liquids only (d) solids only.
3. The two main applications of capillary viscometer are ..... and .....
4. If the pH of a solution is less than 7, the solution is ..... and if greater than 7, then solution is .....
5. Radiation densitometers are suitable for density measurement of .....
   (a) liquids & gases (b) solids & liquids (c) solids & gases (d) solids, liquids & gases
6. State the application of load cell.
7. The most commonly used material for the torque tube of displacer level detector is .....
8. Which type of load cell uses Villari effect for measuring force?
9. Rheometer is also knowm as ..... viscometer.
10. Which principle is used in the level measurement using displacer method?

SECTION B- Short answers type questions. (One or two Sentences each) Answer any TEN. (2 marks)

11. Define a Load cell.
12. Define viscosity
13. What is a hygrometer?
14. List the various units of Humidity.
15. What is meant by hysteresis error in a load cell.
16. Differentiate Relative humidity from absolute humidity.
17. What is the principle of densitometer?
18. List the different indirect level measuring methods.
19. What is the principle of Saybolt viscometer ?
20. Define Dew point.
21. Define Stokes's law.
22. Define density.

SECTION C- Paragraph type questions. (Five marks each) (Answer any SIX).

23. Explain the working of a Psychometer.
24. Explain constant volume hydrometer.
25. Write short notes on strain gauge load cell method.
26. What is a Psychometer? Explain its operation.
27. Explain the working of Ostwald viscometer.
28. Explain the terms absolute and kinematic viscosity.
29. Discuss about the various types of electrodes used in pH measurement

30. Discuss about continuous weighing and semi continuous feed belt weighing.
31. Explain the principle of pH measurement.

SECTION D (Essay Type Questions. 10 Marks each). Answer any TWO.

32. Explain any two direct methods of level measurement in detail.

33. Explain the construction and working of a gas electrode pH measurement system along with the circuits used for converting emf into corresponding pH values.

34. Explain the operation of dew point hygrometer and aluminium oxide hygrometer.

35. Explain any two methods of density measurement with neat diagrams

FIFTH SEMESTER

CUCBCSS UG 2014-Scheme,

Core Course (IN5B-08) CONTROL SYSTEMS

Time: 3 Hrs **Max: 80**

Marks

SECTION A: Objective type questions. Answer all questions. (One Mark each)

1. Steady state velocity error of type I system is :
   (a) Constant (b) Zero (c) Infinity (d) Can't say
2. Transfer Function method can be applied only to ..... systems.
3. If all the poles of a system are in the left half of the s-plane , the system is .....
4. Which time domain performance specification depends only on the damping factor?
5. A Control system in which the control action is somehow dependent on the output is known as ……..
6. The transfer function is the ratio of ..... to .....
7. ..... is the time taken for response to reach 50% of the final value , the very first time.
8. Laplace transform transfers difficult differential equation into .....
9. System sensitivity is the ratio of ..... to .....
10. Advantage of closed loop feedback control system is its ability to reduce the .....

SECTION B- Short answers type questions. (One or two Sentences each) Answer any TEN. (2 marks)

11. Using suitable diagram explain overshoot and settling time.

12. Determine the static error constants for type zero, type one and type two systems.

13. Define Gain margin.

14. What is meant by manipulated variable?
15. What are the standard test input signals? Write down their Laplace transforms.
16. Draw a diagram showing the step response of a second order under damped system.
17. Draw a suitable frequency response diagram and indicate gain margin and phase margin.
18. Define transfer function of a linear system
19. Give the advantages of block diagram representation of feedback control system.
20. Define Laplace transform.
21. Define linear system.
22. What is servo mechanism.

SECTION C- Paragraph type questions. (Five marks each) (Answer any SIX).

23. Write down Force-torque-voltage analogy.

24. Explain the procedure to find the gain margin and phase margin from polar plot.

25. Explain Routh Hurwitz criterion.

26. Derive the response of a first order process to a step input.

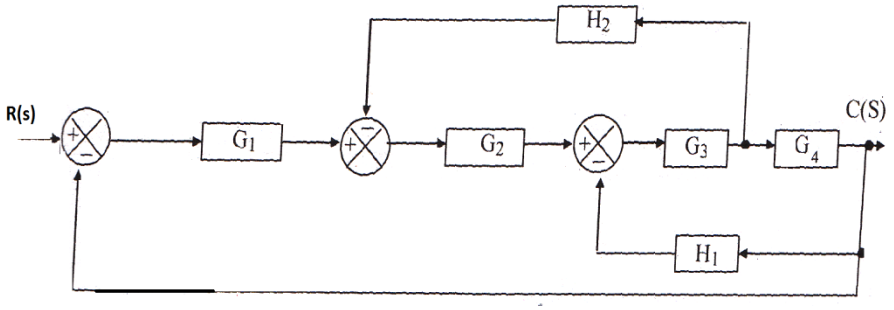
27. What are steady state error constants? How do we determine them?
28. Distinguish between open loop and closed loop systems.
29. Draw the block diagram of armature controlled d.c motor.
30. Explain Masons gain formula with an example.
31. Write short notes on time variant and time invariant systems.

SECTION D (Essay Type Questions. 10 Marks each). Answer any TWO.

32. What are bode plots? Sketch the bode plot of a first order system and explain its features. Define phase margin and gain margin.

33. Construct Routh array and determine the stability of the system whose characteristic equation $s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16 = 0$. Also determine the number of roots lying on right half of s-plane, left half of s-plane and on imaginary axis.

34. Using block diagram reduction techniques obtain the overall transfer function C/R by reducing the block diagram shown below.



35. Derive the Transfer function of a liquid level system with neat diagram.

FIFTH SEMESTER
CUCBCSS UG 2014-Scheme,
Core Course (IN5B-09) ANALYTICAL INSTRUMENTATION

Time: 3 Hrs **Max: 80**

Marks

SECTION A: Objective type questions. Answer all questions. (One Mark each)

1. Absorbance property of a material is also called as .....
2. The most commonly used device for X – ray radiation is .....
3. Hydrogen discharge lamps are used in ..... spectroscope.
4. Thermography is the display of .....
5. HPLC means .....
6. The change in angle of diffraction corresponding to a unit change in wavelength of light is called.....
7. The spectrum of light emitted by a black body can be approximated by ..... law.
8. As per Bragg equation q = ...
9. Name the instrument used in IR spectrometry.
10. ..... is a wave property of electromagnetic radiation that causes the radiation to bend as it passes by an edge.

SECTION B- Short answers type questions. (One or two Sentences each) Answer any TEN. (2 marks)

11. Define grating.
12. What are the advantages of FTIR spectrometer?
13. Explain the principle of TGA.
14. Give the principle of Xray absorption spectrometer.
15. Define Monochromator.
16. Explain chromatographic column.
17. What are the different types of spectrophotometer?
18. What is pyrolysis?
19. Define Spectrophotometer.
20. What is the principle of DSC?
21. Define DTA
22. Define Bragg's law.

SECTION C- Paragraph type questions. (Five marks each) (Answer any SIX).

23. Explain about Gas chromatography
24. Briefly describe about X – ray detector.
25. Explain about Raman Spectrometer
26. Explain fluorescence Spectrometer.
27. Explain briefly High Pressure Liquid Chromatography (HPLC)
28. Write short notes on IR detectors.
29. Discuss about magnetic deflection mass analyser.
30. Discuss about PC based spectrophotometer.
31. Explain the working of ESR spectrometer with neat diagram

SECTION D (Essay Type Questions. 10 Marks each). Answer any TWO.

32. Explain in detail about prism monochromators and different types of gratings.

33. Discuss about Gas liquid chromatography.

34. Explain with a neat diagram a typical double beam IR spectrometer and its working

35. Draw the block diagram of pulsed FT NMR spectrometer and explain its working with the principle.

FIFTH SEMESTER

CUCBCSS UG 2014-Scheme,

Core Course (IN5B-10) OPTO ELECTRONIC INSTRUMENTATION

Time: 3 Hrs **Max: 80**

Marks

SECTION A: Objective type questions. Answer all questions. (One Mark each)

1. The important property of laser is .....
   (a) high temporal coherence (b) high spatial coherence (c) directionality (d) all of these.
2. The numerical aperture of step index fibre is .....
3. The three dimensional recording of images is called .....
   (a) Image recording (b) Holography (c) Photography (d) optical imaging
4. The working principle of a photo cell is .....
   (a) photo voltaic effect (b) photo conductive effect (c) photo multiplication (d) nano conductivity

5. The link between fibre optic communication link and the basic units is .....
   (a) optocoupler (b) LED (c) Laser diode (d) LDR
6. The technique used for joining broken fibre cables is .....
   (a) splicing (b) optical sensors (c) welding (d) none of these
7. Interference filters made for reflections are called .....
8. The intermodal dispersion effect is exhibited by ..... fibers
9. Light passing through a material medium will be separated according to wave lengths by the effect known as .....
10. Pulse dispersion in step index fiber is rectified using
    (a) graded index fiber (b) single mode fiber (c) Multimode fiber (d) semiconductor laser

SECTION B- Short answers type questions. (One or two Sentences each) Answer any TEN. (2 marks)

11. Write any four applications of laser.
12. Explain the working of LED.
13. What is meant by pumping in producing laser?
14. Discuss the importance of numerical aperture in optical fiber.
15. Discuss the features of graded index fibres
16. What are the various types of fibre optic sensors?
17. Explain the features of OTDR fibres.
18. Write short notes on PIN diodes.
19. Explain what is meant by population inversion.
20. What is Q switching ?
21. Explain the difference between step index and graded index fiber.
22. What are the different interferometric techniques used for optical measurements.

SECTION C- Paragraph type questions. (Five marks each) (Answer any SIX).

23. What are photovoltaic detectors?
24. Compare prism spectra and grating spectra.
25. What is multiple beam interferometry?

26. Explain the principle of electro – optic modulation.
27. Explain the working of photomultiplier tude.
28. Write short notes on Doppler anemometry.
29. Distinguish between multimode and single mode fibers.
30. Write short notes on antireflective coatings.
31. Explain Splicing in lasers.

SECTION D (Essay Type Questions. 10 Marks each). Answer any TWO.

32. Discuss the working of any one gas laser. Mention some of its important applications.

33. Explain the principle of Fabry – Perot interferometer. Discuss one of its applications.

34. Explain the different stages of fibre optic communication with a block diagram.

35. Discuss the working of Micelson's interferometer with neat diagram. Mention its applications.

FIFTH SEMESTER

CUCBCSS UG 2014-Scheme,

Core Course (IN5B-11) MICROPROCESSORS

Time: 3 Hrs **Max: 80**

Marks

SECTION A: Objective type questions. Answer all questions. (One Mark each)

1. In a Microprocessor 8085, address bus width is .....
   (a) 4 bit (b) 8 bit (c) 12 bit (d) 16 bit.
2. Which of the following is used to transfer information between the Microprocessor and I/O devices ? (a) Data bus (b) address bus (c) clock input (d) none of the above.
3. Which one following is a programmable DMA controller?
   (a) 8251 (b) 8255 (c) 8257 (d) 8755
4. A ..... is group of conducting lines that carries data, address and control signals.
5. ALE means.....
6. The instruction MVI B, 3EH is an example of ..... addressing mode.
7. ..... is a non vectored interrupt.
   (a) TRAP (b) INTR (c) RST 5.5 (d) RST 6.5
8. Stack pointer is a ..... bit register.
9. An example for non maskable interrupt is .....
10. The 8085 Microprocessor has ..... number of flag register.

SECTION B- Short answers type questions. (One or two Sentences each) Answer any TEN. (2 marks)

11. What is the function of assemblers?
12. What is machine cycle?
13. What determines that a microprocessor is 8, 16 or 32 bit?
14. What is meant by a Macro?
15. What is a flag?
16. What is PSW?
17. What is the difference between CALL and JUMP instructions?
18. What is meant by Timing diagram?
19. Explain the functions of ALE and IO/M signals of the 8085 microprocessor.
20. Describe the execution of PUSH and POP instructions.
21. What are the functions of accumulator?
22. Enumerate the data transfer instructions of 8085.

SECTION C- Paragraph type questions. (Five marks each) (Answer any SIX).

23. Draw the basic functional block diagram of a microprocessor and explain.
24. Explain the function of each flag in 8085.
25. List the four categories of 8085 instruction that manipulate data.
26. Write down a 8085 assembly language program to add two 8 bit numbers.
27. Discuss about interrupts in 8085 Microprocessor.
28. Discuss the Interfacing of 8085 with Programmable Peripheral Interface 8255.
29. Explain the addressing modes of 8085 Microprocessor.
30. Explain the interfacing of DAC with 8085 Microprocessor.

31. Discuss about the interrupts in 8086 Microprocessor.

SECTION D (Essay Type Questions. 10 Marks each). Answer any TWO.

32. Explain the architecture of 8085 microprocessor with a relevant schematic diagram.

33. Explain the application of Microprocessor in stepper motor control.

34. Explain the addressing modes of 8086 with examples.

35. Explain the architecture of 8086 microprocessor with a relevant schematic diagram.

SIXTH SEMESTER

CUCBCSS UG 2014-Scheme,

Core Course (IN6B-12) PROCESS CONTROL INSTRUMENTATION

Time: 3 Hrs **Max: 80**

Marks

SECTION A: Objective type questions. Answer all questions. (One Mark each)

1. Which one of the following is not a continuous controller mode?
   (a) proportional mode (b) proportional integral mode (c) derivative mode (d) floating mode
2. Which of the following is not a process variable?
   (a) Temperature (b) Pressure (c) Volume (d) pH
3. ..... refers to the time for the process control loop to make necessary adjustments to the final control element.
4. Flapper nozzle is used in a/an ..... controller.
   (a) hydraulic (b) electronic (c) pneumatic (d) none of these
5. Which of the following controllers has the least maximum deviation?
   (a) P-I controller (b) P controller (c) P-D controller (d) P-I-D controller.
6. Reset rate is the another term used for ..... time.
7. In proportional integral control, integral action is used to .....
   (a) increase speed of response (b) minimise overshoot (c) minimise cycling (d) minimise steady state error
8. A controller operates with ..... when an increasing value of controlled variable causes an increasing value of the controller output.
9. Which continuous controller mode cannot be used as a standalone control mode?
10. Which tuning method can be used only in the case of self regulating process?

SECTION B- Short answers type questions. (One or two Sentences each) Answer any TEN. (2 marks)

11. Draw a block diagram of a typical process control system.
12. Explain the three parts of final control element.
13. Define process load.
14. Define Proportional band.
15. What is neutral zone?
16. Why integral action is also called reset action?
17. Define Process lag.
18. Define dead time.
19. What are actuators?
20. What is meant by manipulated variable?
21. Give any two example of digital process control.
22. What is meant by control lag?

SECTION C- Paragraph type questions. (Five marks each) (Answer any SIX).

23. Explain two position control. Discuss its drawbacks.
24. Write short notes on digital control systems.
25. With necessary diagram explain electronic controllers
26. List the criteria to evaluate process loop responses.

27. Discuss the general features of analog controllers.
28. Discuss about Pneumatic controllers.
29. Differentiate floating controller mode and continuous controller mode.
30. Write Short notes on computer data logging.
31. Discuss about three mode controller. Mention its advantages.

SECTION D (Essay Type Questions. 10 Marks each). Answer any TWO.

32. With a neat block diagram, explain direct digital control.

33. List and explain various Controller modes.

34. Explain the continuous oscillation method of process loop tuning?

35. Explain about supervisory control and Direct Digital Control.

SIXTH SEMESTER

CUCBCSS UG 2014-Scheme,

Core Course (IN6B-13) BIOMEDICAL INSTRUMENTATION

Time: 3 Hrs **Max: 80**

Marks

SECTION A: Objective type questions. Answer all questions. (One Mark each)

1. The bio electric generator of heart is situated at .....
   (a) Aortic valve (b) SA Node (c) AV node (d) none of these.
2. Which of the following electrodes have high impedance?
   (a) Surface electrodes (b) Needle electrodes (c) Micro electrodes (d) Disc electrodes
3. EEG signals originated from the .....
   (a) Sino atrial node (b) Gila cells (c) Motor Unit (d) Acetylcholine

4. The heart sounds are recorded by .....
   (a) electrocardiography (b) endoscope (c) phono cardiography (d) none of these
5. An endoscope is an instrument for examine
   (a) a body cavity (b) the cancer cells (c) blood flow rates (d) the head surfaces
6. Magnitude of resting potential ranges from :
   (a) 60 – 120 mV (b) 70 -120 mV (c) 70 – 100 mV (d) 0 – 70 mV
7. The device which converts one form of energy to the other is called .....
8. When we are awake and very alert , the EEG normally shows .....waves
   (a) alpha (b) Delta (c) Beta (d) Theta
9. The normal blood pressure range of a human being is .....
10. The recorded representation of bioelectric potentials generated by the neuronal activity of the brain is called .....

SECTION B- Short answers type questions. (One or two Sentences each) Answer any TEN. (2 marks)

11. Distinguish between depolarization and repolarisation of a cell.
12. What are resting and action potential ?
13. What is defibrillator?
14. What is Einthoven triangle.
15. What is computed tomography?
16. What is nerve conduction rate?
17. What ate muscle simulators?
18. What are the different types of EEG wavr forms?
19. Give any two applications of phonocardiogram.
20. What is meant by let go current level?
21. Briefly explain Bio electric Potentials.
22. List the different types of surface electrodes.

SECTION C- Paragraph type questions. (Five marks each) (Answer any SIX).

23. Briefly explain different types of artificial heart valves.
24. Draw the block diagram of bio medial instrument system and explain.
25. What is meant by EMG?

26. Define systolic and diastolic pressures
27. Draw the circuit diagram of an ECG isolation amplifier.
28. Write short notes on Plethysmography.
29. Discuss about Ultrasonic bloodflowmeters.
30. Discuss about the application of lasers in diagnosis and therapy
31. Explain the blood flow measurement using Thermal Convection method.

SECTION D (Essay Type Questions. 10 Marks each). Answer any TWO.

32. Describe in detail the recording set up of EEG.

33. Explain the different types of biotelemetry system.

34. Explain various methods of ECG recording setup.

35. Distinguish between internal and external pacemaker. Discuss in detail the different mode of operation of pace makers.

Core Course (IN6B-14) MICROCONTROLLERS

Time: 3 Hrs **Max: 80**

Marks

SECTION A: Objective type questions. Answer all questions. (One Mark each)

1. The 8051 Microcontroller does not have ..... flag.
   (a) carry (b) auxiliary carry (c) zero (d) overflow
2. The internal RAM memory of 8051 is ..... bytes.
   (a) 32 (b) 64 (c) 128 (d) 256
3. The 8051 has ..... 16 bit timers/ counters. (a) 1 (b) 2 (c) 3 (d) 4
4. Microcontrollers often have .....
   (a) CPU (b) RAM (c) ROM (d) all the above.
5. ..... is the special function register in 8051 that holds the data received through the serial port.
6. The 8051 Microcontroller has ..... parallel I/O ports
   (a) 2 (b) 3 (c) 4 (d) 5
7. Which of the following commands will move the number 27H into the accumulator.
   (a) MOV A,P27 (b) MOV A,#27H (c) MOV A,27H (d) MOV A,@27H
8. Which register in 8051 contains the bits used to select the register banks?
9. In 8051 which interrupt has the highest priority?
10. Which timer in which mode is used for baud rate generation in 8051?

SECTION B- Short answers type questions. (One or two Sentences each) Answer any TEN. (2 marks)

11. Draw the functional block diagram of a Microcontroller.
12. Explain Push and Pop instructions.
13. Describe the internal RAM of 8051.
14. What is PSW in an 8051?
15. What are the different classifications of 8051 instructions?
16. Mention the four modes of timer operation.
17. List the features of 8051 Micro controller
18. Explain the instruction MOVX A,@DPTR
19. Define baud rate.
20. What is the function of the Gate bit in TMOD register in 8051?
21. What is a compiler?
22. What is meant by stack?

SECTION C- Paragraph type questions. (Five marks each) (Answer any SIX).

23. Compare microprocessors and microcontrollers.
24. What is a microcontroller?
25. Discuss about special function registers of 8051 Microcontroller.
26. Explain the functional pin diagram of 8051 Microcontroller.
27. Draw a schematic foe interfacing a stepper motor with 8051 microcontroller?

28. Discuss about the interfacing of seven segment display with 8051 Microcontroller .
29. Discuss about the interrupts of 8051 Microcontroller
30. Explain the structure of the internal RAM of 8051.
31. Write an 8051 ALP to multiply two 8 bit numbers.

SECTION D (Essay Type Questions. 10 Marks each). Answer any TWO.

32. Explain the architecture of 8051 Microcontroller with a relevant schematic diagram.

33. Explain how ADC and DAC are interfaced with 8051 microcontroller with schematic diagram.

34. Explain in detail the operation of the internal timer/counter of 8051 Microcontroller.

35. Explain the various addressing modes of 8051 Microcontroller with examples.

MODEL QUESTION PAPERS
FOR
OPEN COURSES

FIFTH SEMESTER – OPEN COURSE

CUCBCSS UG 2014-Scheme,

(IN5D-01) ELEMENTS OF ENVIRONMENTAL SCIENCE

Time: 2 Hrs **Max: 40**

Marks

SECTION A: Objective type questions. Answer all questions. (One Mark each)

1. The complex network of interconnected food chains is called ……..
   a) Trophic level
   b) Food web
   c) Ecological pyramid
   d) None of these

2. The Ocean cover …… percentage of Earth's surface.
   a) 51 %
   b) 61 %
   c) 71 %
   d) 81%.

3. The components of LPG are ……
   a) Methane & Hexane
   b) Propane & Butane
   c) Ethane & Methane
   d) Ethane & Hexane

4. The combination of smoke, fog and chemical pollutants seen in industrialized cities is known as ……
   a) Sol
   b) Smog
   c) Fallout
   d) Fog

5. Major cause of Ozone depletion is due to which chemical ……
   a) Chloroflurocarbons
   b) Polyphenols
   c) Dioxins
   d) Methane

SECTION B- Short answers type questions. (One or two Sentences each) Answer all questions (2 marks)

6. What is abiotic environment?
7. What are the natural resources based on the abundance?
8. What are the sources of air pollution?
9. What is acid rain?
10. Define Environment.

SECTION C- Paragraph type questions. (Five marks each) (Answer any THREE).

11. What is global warming?
12. Discuss about sustainable and unsustainable development.
13. Explain Environmental degradation.
14. Discuss about the Role of individual in the prevention of pollution.
15. Explain Eutrophication.

SECTION D (Essay Type Questions. 10 Marks each). Answer any ONE.

16. Explain briefly Lithosphere & Hydrosphere

17. What are the uses of forest resources? Explain in detail

18. Discuss about Thermal pollution & Marine pollution in detail.

FIFTH SEMESTER – OPEN COURSE

CUCBCSS UG 2014-Scheme,

(IN5D-02) ENERGY RESOURCES AND UTILIZATION METHODS

Time: 2 Hrs **Max: 40**

Marks

SECTION A: Objective type questions. Answer all questions. (One Mark each)

1. The predominant source of energy on earth is
   (a) Electricity (b) Natural Gas (c) The Sun (d) Plants

2. In what form can solar energy be used?
   (a) Thermal energy (b) Electrical energy 3. Mechanical Energy (d) All of above

3. What kind of energy does a wind turbine use?
   (a) Kinetic energy (b) Potential energy (c) Chemical Energy (d) Thermal energy

4. Biomass can be converted into
   (a) Solid fuel (b) Liquid fuel (c) Gaseous fuel (d) All of the above

5. Which of the following energy originate from the ocean?
   (a) Tidal energy (b) Sea energy (c) Wind energy (d) Hydropower

SECTION B- Short answers type questions. (One or two Sentences each) Answer all questions (2 marks)

6. What is renewable energy resources?
7. Name four alternative energy resourses.
8. What is the principle of biomass energy conversion.
9. How can we classify energy sources as renewable, nonrenewable or inexhaustible?
10. What is meant by energy system?

SECTION C- Paragraph type questions. (Five marks each) (Answer any THREE).

11. Explain Photosynthesis.
12. What are the merits and demerits of biomass energy.
13. Discuss about the energy from waves and tides.
14. Explain Global Warming.
15. What is meant by biomass energy? Mention its merits and demerits.

SECTION D (Essay Type Questions. 10 Marks each). Answer any ONE.

16. Discuss about the various forms of energy , applications , merits and demerits.

17. Discuss about Solar energy in detail.

18. Discuss about Wind energy in detail.

FIFTH SEMESTER – OPEN COURSE

CUCBCSS UG 2014-Scheme,

(IN5D-03) SCIENCE OF EQUIPMENTS AND INSTRUMENTS IN MODERN LIFE

Time: 2 Hrs **Max: 40**

Marks

SECTION A: Objective type questions. Answer all questions. (One Mark each)

1. X –rays were discovered by .....

2. SIM stands for …….

3. ..... is the basis of all electric motor operation.

4. Expand CT scan.

5. ECG is used for the study of .....

SECTION B- Short answers type questions. (One or two Sentences each) Answer all questions (2 marks)

6. What is SIM card ?
7. What is ECG?
8. Mention four applications of X – ray.
9. Define cell phone
10. What is meant by Ultra sound scan.

SECTION C- Paragraph type questions. (Five marks each) (Answer any THREE).

11. Explain Tunnelling Electron Microscope (TEM).
12. Explain Spectrophotometer
13. Describe Spectrophotometer.
14. Explain MRI Scan with principle and applications
15. Compare Over head Projector (OHP) and LCD Projector.

SECTION D (Essay Type Questions. 10 Marks each). Answer any ONE.

16. Describe CT Scan, its basic principle . Mention the applications & advantages
17. Discuss about Scanning Electron Microscope (SEM) and Atomic Force Microscope (AFM) in detail
18. Draw the block diagram of Public address system and explain the function of each unit.

MODEL QUESTION PAPERS
FOR
ELECTIVE COURSES

SIXTH SEMESTER – ELECTIVE COURSE

CUCBCSS UG 2014-Scheme,

(IN6B-15a) POWER PLANT INSTRUMENTATION

Time: 3 Hrs **Max: 80**

Marks

SECTION A: Objective type questions. Answer all questions. (One Mark each)

1. PWR means .....
2. In nuclear reactors ..... prevents radioactive fission products from escaping the fuel pellets into the reactor cooling water.
3. The saturation temperature at the partial pressure of water vapour is called .....
4. The .....is the frequency at which alternating current (AC) is transmitted from a power plant to the end user .
5. ..... is a device in which nuclear chain reactions are initiated, controlled, and sustained at a steady rate, as opposed to a nuclear bomb, in which the chain reaction occurs in a fraction of a second and is uncontrolled causing an explosion

6. ..... is a cycle which converts heat into work.
7. The ..... is measure of hydrogen ions in a solution and as represented by the negative logarithm of the hydrogen concentration.

8. Which of the following ia s monitoring parameter in vibration measurement?
(a) acceleration (b) pressure (c) temperature (d) none of these.
9. The ..... temperature of a substance is the temperature at and above which vapour of the substance cannot be liquefied, no matter how much pressure is applied.

10. Name the two scales used for the temperature measurement in power plants.

SECTION B- Short answers type questions. (One or two Sentences each) Answer any TEN. (2 marks)

11. List out names of gaseous fuels?
12. What is meant by caloric value of fuel?
13. Draw the flow sheet symbol of a dryer?
14. Explain the working principle of steam turbine?
15. What is the requirement of blow down in power plants?
16. What is the significance of air fuel ratio?
17. Why shell temperature monitoring is important in power plants?
18. What is the significance of air preheating?
19. What is pH meter?
20. Explain BFP recirculation control

21. What is MFT turbine trip control ?
22. What is Drum level control ?

SECTION C- Paragraph type questions. (Five marks each) (Answer any SIX).

23. Describe the commonly using cooling water systems in power plants.
24. What are the commonly using types of condensers? Explain?

25. Describe about TDS meter.

26. With a neat sketch explain about any pneumatic instrumentation system?

27. Why bypass dampers are used in power plants?

28. What are the commonly using methods for the water treatment?

29. Describe about Rankine and Brayton cycles?

30. Discuss about the Pollution from power plants.
31. Discuss about two element and three-element control.

SECTION D (Essay Type Questions. 10 Marks each). Answer any TWO.

32. Describe the importance of smoke density measurements and a method for smoke density measurement?

33. Write a note about burner tilting and super heaters?

34. Discuss briefly about Measurement and analysis in the power plants

35. Describe one line diagram of typical pneumatic, hydraulic & electrical instrumentation systems with examples.

SIXTH SEMESTER – ELECTIVE COURSE

CUCBCSS UG 2014-Scheme,

(IN6B-15b) INSTRUMENTS-PRINCIPLES AND APPLICATIONS

Time: 3 Hrs **Max: 80**

Marks

SECTION A: Objective type questions. Answer all questions. (One Mark each)

1. ..... converts electrical energy to microwave radiation.
2. Expand AFM.
3. FM varies ..... of the carrier
   (a) amplitude (b) frequency (c) Phase (d) None of the above.
4. X – rays were discovered by .....
5. The signals transmitted from mobile to the base station is termed as.....
6. SIM stands for.....
7. ..... converts electrical energy to mechanical energy.
8. Optical fibre is based on the principle of
   (a) Total internal reflection (b) refraction (c) Reflection (d) none of these
9. The equation for the torque available at the motor shaft in an electric motor is given by...
10. OMR means.....

SECTION B- Short answers type questions. (One or two Sentences each) Answer any TEN. (2 marks)

11. What is CT scan?
12. Explain the principle of microwave oven.
13. List the applications of X-ray.
14. What is X – ray diffraction
15. What is ultrasound.
16. Write any three applications of XRD.
17. Explain Bragg's law.
18. What is ATM?
19. Give the disadvantages of microwave heating.
20. Write any three applications of optical mark reading.
21. What are the different types of brakes?
22. What are the two types of A.C motor

SECTION C- Paragraph type questions. (Five marks each) (Answer any SIX).

23. Explain Holography.
24. Compare two stroke and four stroke engines.
25. Explain the principle of LCD Projector.
26. Compare centrifugal and reciprocating pumps.
27. Explain the principle of Electron microscope.

28 . Describe Holography with neat diagram.
29. With the help of block diagram explain the working of television.
30. Explain the working of an automobile engine.
31. Explain the working principle of refrigerator.

SECTION D (Essay Type Questions. 10 Marks each). Answer any TWO.

32. Draw the block diagram of Public address system and explain the function of each unit.

33. Discuss about Scanning Electron Microscope (SEM) and Tunnelling Electron Microscope (TEM) in detail

34. Explain Spectrophotometer, its working and applications

35. Explain the classification of IC engines

SIXTH SEMESTER – ELECTIVE COURSE
CUCBCSS UG 2014-Scheme,
(IN6B-15c)
PROGRAMMABLE LOGIC CONTROLLERS and SCADA

Time: 3 Hrs **Max: 80 Marks**

SECTION A: Objective type questions. Answer all questions. (One Mark each)

1. Which of the following is most likely to be the voltage level used internally in a PLC, excluding the voltage levels that might occur during conditioning in output/input channels…?
A) 5 V B) 24 V C) 110 V D) 240 V

2. A diaphragm pressure sensor is required to give a measure of the gauge pressure present in a system. Such a sensor will need to have a diaphragm with ….
A) A vacuum on one side. B) One side open to the atmosphere. C) The pressure applied to both sides. D) A controlled adjustable pressure applied to one side.

3. The change in resistance of an electrical resistance strain gauge with a gauge factor of 2.0 and resistance 100 Ω when subject to a strain of 0.001 is ……..
A) 0.0002 ΩB) 0.002 Ω) 0.02 ΩD) 0.2 Ω

4. An incremental shaft encoder gives an output which is a direct measure of ……..
A) The diameter of the shaft. B) The change in diameter of the shaft.
C) The change in angular position of the shaft. D) The absolute angular position of the shaft.

5. RTU stands for ……

6. SCADA stands for.....

7. The …… indicates how much the output of an instrument system or system element changes when the quantity being measured changes by a given amount, that is, the ratio ouput/input.
8. The arrangement of inputs in Figure A is described by the Boolean expression:
(a) A.B.C (b) (A+C).B (c) (A+B).C (d) A.C + B
9. Which form of logic gate system is given by a ladder diagram with a rung having two normally open sets of contacts in parallel?
10. SCADA systems should have ….. A) HMI B) Alarm Processing C) Data Log D) All the above

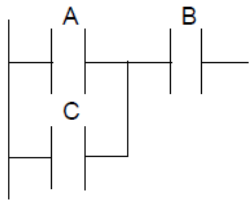


Fig A

SECTION B- Short answers type questions. (One or two Sentences each) Answer any TEN. (2 marks)

11. Define PLC.
12. What is meant by Sensitivity of a Sensor?
13. Define SCADA.
14. Describe Ladder Diagrams.
15. Draw the Ladder diagram for OR logic gate system.
16. Write any three applications of XRD.
17. Draw the Ladder diagram for NAND logic gate system.
18. Draw the Ladder diagram for AND logic gate system.
19. Give the advantages of PLC.
20. What is meant by Relay?
21. What is meant by smart sensor?
22. Define the term Sinking.

SECTION C- Paragraph type questions. (Five marks each) (Answer any SIX).

23. Draw the functional block diagram of a PLC and describe.
24. Discuss about battery backed relays.
25. Discuss about master control relay.
26. Explain encoders.
27. Explain Latching in ladder diagram programming.
28. Draw the Ladder diagram for Valve operation program.
29. Explain how the on−off operation and direction of a d.c. motor can be controlled by switches..
30. Explain Pulse timers.
31. Explain UP and Down Counting.

SECTION D (Essay Type Questions. 10 Marks each). Answer any TWO.

32. Describe the Internal Architecture of a PLC with neat diagram.
33. Discuss about the application of PLC in Process Control in detail.
34. Explain PLC based Input and Output devices in detail.
35. Briefly discuss about SCADA systems, elements and communication in SCADA systems.