P.G. Diploma in **Prospectus No.20151246**
i) Mechatronics
ii) Biomedical Electronics, and
iii) Computer Maintenance

संत गाडगे बाबा अमरावती विद्यापीठ

SANT GADGE BABA AMRAVATI UNIVERSITY

विज्ञान विद्याशाखा

(FACULTY OF SCIENCE)

PROSPECTUS
OF
The Examination for the Post Graduate Diploma in
i) Mechatronics,
ii) Biomedical Electronics, and
iii) Computer Maintenance
Semester-I, Winter-2014
Semester-II, Summer-2015 & onwards

2014

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Post Graduate Diploma in i) Mechatronics, ii) Biomedical Electronics and iii) Computer Maintenance
(One Year – Semester Pattern)
(Semester-I & II)
(Prospectus No. 20151246)

SANT GADGE BABA AMRAVATI UNIVERSITY

SPECIAL NOTE FOR INFORMATION OF THE STUDENTS

(1) Notwithstanding anything to the contrary, it is notified for general information and guidance of all concerned that a person, who has passed the qualifying examination and is eligible for admission only to the corresponding next higher examination as an ex-student or an external candidate, shall be examined in accordance with the syllabus of such next higher examination in force at the time of such examination in such subjects papers or combination of papers in which students from University Departments or Colleges are to be examined by the University.

(2) Be it known to all the students desirous to take examination/s for which this prospectus has been prescribed should, if found necessary for any other information regarding examinations etc., refer the University Ordinance Booklet the various conditions/provisions pertaining to examination as prescribed in the following Ordinances.

Ordinance No. 1	:	Enrolment of Students.
Ordinance No. 2	:	Admission of Students
Ordinance No. 4	:	National cadet corps
Ordinance No. 6	:	Examinations in General (relevent extracts)
Ordinance No. 18/2001	:	An Ordinance to provide grace marks for passing in a Head of passing and Inprovement of Division (Higher Class) and getting Distinction in the subject and condonation of defficiency of marks in a subject in all the faculties prescribed by the Statute No.18, Ordinance 2001.
Ordinance No. 9	:	Conduct of Examinations (relevent extracts)
Ordinance No. 10	:	Providing for Exemptions and Compartments
Ordinance No. 19	:	Admission of Candidates to Degrees.

Ordinance No. 109	:	Recording of a change of name of a University student in the records of the University.
Ordinance No. 6 of 2008	:	For improvement of Division/Grade.
Ordinance No.19/2001	:	An Ordinance for Central Assessment Programme, Scheme of Evaluation and Moderation of answerbooks and preparation of results of the examinations, conducted by the University, Ordinance 2001.

Registrar
Sant Gadge Baba Amravati University

PATTERN OF QUESTION PAPER ON THE UNIT SYSTEM

The pattern of question paper as per unit system will be boradly based on the following pattern.

(1) Syllabus has been divided into units equal to the number of question to be answered in the paper. On each unit there will be a question either a long answer type or a short answer type.

(2) Number of question will be in accordance with the unit prescribed in the syllabi for each paper i.e. there will be one question on each unit.

(3) For every question long answer type or short answer type there will be an alternative choice from the same unit. However, there will be no internal choice in a question.

(4) Division of marks between long answer and short answer type question will be in the ratio of 40 and 60.

(5) Each short answer type question shall Contain 4 to 8 short sub question with no internal choice.

*****

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI

DIRECTION

No. : 13 / 2012 Date : 13/4/2012

Subjects : Examinations leading to the Post - Graduate Diploma in (i) Mechatronics, (ii) Biomedical Electronics, and (iii) Computer Maintenance (Semester Pattern-One Year (Full Time) P.G.Diploma Course] in the faculty of Science, Directions, 2012.

Whereas, Govt. of Maharashtra, Department of Higher and Technical Education, vide its letter No. NGC-2011/(118/110), मशि-४, दि.९ ऑगष्ट, 2011 has sanctioned approval for starting of Post - Graduate Diploma course in (i) Mechatronics, and (ii) Biomedical Electronics.

AND

Whereas, the Academic Council in its meeting held on 30.3.2011, vide item No.24(7) J) R-2, R-3 & R-4 has accepted the draft syllabi with scheme of examination, eligibility criteria, and other details for one year P.G. Diploma courses in (i) Computer Maintenanc, (ii) Biomedical Electronics, and (iii) Mechatronics.

AND

Whereas, authority of this Unversity has granted first time affiliation to Post Graduate Diploma course in (i) Mechatronics, and (ii) Biomedical Electronics from the Academic Session 2011-12 and communicated the same to the concern college vide this office letter No.SGBAU/8-C/A-271/ 2011, dt.25.10.2011.

AND

Whereas, Schemes of Examinations of above said courses, which is to be implemented from the Academic Session 2012-13 for Semester-I & II and onwards which are to be regulated by an Ordinance and making Ordinance is time consuming process.

AND

Whereas, the admission of students in the above said courses are to be made in the Academic Session 2012-13 in the affiliated college.

Now, therefore, I, Dr.Mohan K.Khedkar, Vice Chancellor, Sant Gadge Baba Amravati University, Amravati in exercise of powers conferred upon me under sub-section (8) of section 14 of the Maharashtra Universities Act., 1994, do hereby direct as under:

1) This Direction may be called ñ Examinations leading to the Post - Graduate Diploma in (i) Mechatronics, (ii) Biomedical Electronics, and (iii) Computer Maintenance (Semester Pattern-One Year (Full Time) P.G.Diploma Course] in the faculty of Science, Directions, 2011.ò.

2) This Direction shall come into force from the date of its issuance.

3) Following shall be the Examinations leading to the Post - Graduate Diploma in-
   (i) Mechatronics/Biomedical Electronics/Computer Maintenance, Semester-I Examination.
   (ii) Mechatronics/Biomedical Electronics/Computer Maintenance, Semester-II Examination.

4) Duration of each of the above semester shall be six months with an examination at the end of each semester.4) Duration of each of the above semester shall be six months with an examinations at the end of each semester.

5) (i) The examinations specified in paragraph 3 above shall be held twice a year at such places and on such dates as may be appointed by the Board of Examinations.5) .
   (i) The examinations specified in paragraph 3 above shall be held twice a year at such places and on such dates as may be appointed by the Board of Examinations.
   (ii) Main Examination of Semester-I shall be held in Winter and Supplementary Examination in Summer. (ii) Main Examination of Semester-I & Semester-III, shall be held in Winter and Supplementary Examination in Summer.
   (iii) Main Examination of Semester-II shall be held in Summer and Supplementary Examination in Winter. (iii) Main Examination of Semester-II & Semester-IV shall be held in Summer and Supplementry Examination in Winter.

6) Subject to his/her compliance with the provisions of this Direction and of other Ordinances in force from time to time, the following candidates shall be eligible for admission to the Post-Graduate Diploma in-

(i) Mechatronics

a) A person who has passed B.Sc. examination with Electronics or Computer Science of this University or any other statutory University recognized equivalent by the Sant Gadge Baba Amravati University.

OR

b) A person who has passed Bachelor of Engineering (Electronics and Power System/Industrial Electronics/Mechanical Engineering) Degree of this University or any other statutory University recognized equivalent by the Sant Gadge Baba Amravati University.

(ii) Biomedical Electronics

a) A person who has passed B.Sc. examination with Electronics or Physics of this University or any other statutory University recognized equivalent by the Sant Gadge Baba Amravati University.

OR

b) A person who has passed Bachelor of Engineering (Electronics Discipline) Degree of this University or any other statutory University recognized equivalent by the Sant Gadge Baba Amravati University.

(iii) Computer Maintenance

a) A person who has passed B.Sc. examination with Mathematic/ Physics/ Electronics / Computer Science / Information Technology / Computer Application (Regular/Vocational)/Computer Maintenance of this University or any other statutory University recognized equivalent by the Sant Gadge Baba Amravati University.

OR

b) A person who has passed Bachelor of Computer Application Degree of Sant Gadge Baba Amravati University only.

7) Subject to his/her compliance with the provisions of this Direction and of other Ordinances (Pertaining to examination in General) in force from time to time, the applicant for admission to examination at the end of the course of study of a particular Semester shall be eligible to appear at it, if: (i) he/she satisfied the conditions in the table and the provisions thereunder :-

TABLE

Sr.No.	Name of examination	The student should have completed the term satisfactorily
1	2	3
1	Diploma in Mechatronics/Biomedical Electronics/ Computer Maintenance Semester-I	Semester-I
2	Diploma in Mechatronics/ Biomedical Electronics/ Computer Maintenance Semester-II	Semester-II

(**Note -** Subjects prescribed and numbered in the scheme of Examinations shall be treated as separate subjects, however, the theory and practical, if any, of the subject shall be treated as separate Head of Passing.)

(ii) He/She has complied with provisions of Ordinance pertaining to Examination in general.

(iii) He/She has prosecuted a regular course of study in University Department/College affiliated to the University.

(iv) He/She has in the opinion of the Head of the Department/ Principal, shown satisfactory progress in his/her studies.

8) Papers and the Practicals in which an examinee is be to examined, maximum marks for these and the minimum pass marks which an examinee must obtain in order to pass in the subjects and the

examination shall be as indicated in Appendices-ôAô, óBô & óCô appended with this Ordinance for P.G.Diploma course in Mechatronics, Biomedical Electronics, Computer Maintenance.

9) Examination fees for each semester of the examination and also the practical examination shall be as prescribed by the University from time to time.

10) An examinee who is successful at Semester-I, Semester-II examinations under this Ordinance and who has obtained 75% or more marks in aggregate of Semester-I, Semester-II Examinations shall be placed in the First Division with Distinction, those obtaining 60% or more but less than 75% shall be placed in the First Division and all other successful examinees shall be placed in the Second Division.

11) (i) Scope of the subjects shall be as indicated in the syllabus.

(ii) Medium of instruction and examination shall be English.

12) Provision of Ordinance No.18 of 2001 relating to an Ordinance to provide grace marks for passing in a head of passing and Improvement of Division (Higher Class) and getting distinction in the subject and condonation of deficiency of marks in a subject in all the faculties prescribed by the Statute No.18 and of Ordinance No.10 relating to Providing for Exemptions and Compartments shall apply to the examination under this Ordinance.

13) An examinee who does not pass or who fails to present himself/herself for the examination shall be eligible for readmission to the same examination on payment of fresh fees and such other fees as may be prescribed.

14) As soon as possible after the examinations, the Board of Examination shall publish a result of the examinees. The result of the examinations shall be classified as above and merit list shall be notified as per Ordinance No. 6

15) Notwithstanding anything to the contrary in this Ordinance, no one shall be admitted to an examination under this Ordinance, if he/she has already passed the same examination or an equivalent examination of any Statutory University.

16) Examinees successful at Post-Graduate Diploma Semester-II Examination shall on payment of prescribed fees, receive a Diploma in the prescribed form signed by the Vice-Chancellor.

Amravati
Date : 12/04/2012

Sd/-
(Dr. M. K. Khedkar)
Vice-Chancellor

****

Appendix-A
Scheme of Teaching and examination for the Post Graduate Diploma in Mechatronics (One Year - Semester Pattern)

Sr. No.	Sub. Code No.	Paper / Practical No.	Subject	Teaching Scheme			Examination Scheme									Grand Total
							Theory					Practical				
				Theory	Practical	Total Periods / week	Duration of Papers (Hrs.)	Max. Marks Theory Papers	Max.Marks Internal Assessment	Total	Min. Pass Marks	Max. Marks	Max. Marks Internal Assessment	Total	Min. Pass Marks	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Semester-I																
1	1MCH1	I	Embedded System and Design	4	-	4	3	40	10	50	20	--	--	--	--	50
2	1MCH2	II	Very Large Scale Integrated Circuit Design	4	-	4	3	40	10	50	20	--	--	--	--	50
3	1MCH3	III	Digital Image Processing	4	-	4	3	40	10	50	20	--	--	--	--	50
4	1MCH4	IV	Electronics Manufacturing Technology	4	-	4	3	40	10	50	20	--	--	--	--	50
5	1MCH5	P-I	Practical I - LAB I	-	6	6	--	--	--	--	--	40	10	50	20	50
6	1MCH6	P-II	Practical II - LAB II	-	6	6	--	--	--	--	--	40	10	50	20	50
			Total	16	12	28				200				100		300
Semester-II																
1	2MCH1	V	Finite Element Techniques	4	-	4	3	40	10	50	20	--	--	--	--	50
2	2MCH2	VI	Industrial Tribology	4	-	4	3	40	10	50	20	--	--	--	--	50
3	2MCH3	VII	Design for Manufacture	4	-	4	3	40	10	50	20	--	--	--	--	50
4	2MCH4	VIII	Real Time Operating System	4	-	4	3	40	10	50	20	--	--	--	--	50
5	2MCH5	P-III	Practical - III LAB –III	-	6	6	--	--	--	--	--	40	10	50	20	50
6	2MCH6	P-IV	Project	-	6	6	--	--	--	--	--	--	--	50	20	50
			Total	16	12	28				200				100		300
															Grand Total of Semester-I & II	600

Appendix-B

Scheme of Teaching and examination for the Post Graduate Diploma in Bio-Medical Electronics (One Year - Semester Pattern)

Sr. No.	Sub. Code No.	Paper / Practical No.	Subject	Teaching Scheme			Examination Scheme									Grand Total
							Theory					Practical				
				Theory	Practical	Total Periods / week	Duration of Papers (Hrs.)	Max. Marks Theory Papers	Max.Marks Internal Assessment	Total	Min. Pass Marks	Max. Marks	Max. Marks Internal Assessment	Total	Min. Pass Marks	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Semester-I																
1	1BME1	I	Medical Physics	4	-	4	3	40	10	50	20	--	--	--	--	50
2	1BME2	II	Microprocessor, Microcontroller and Computer Applications in Medicine	4	-	4	3	40	10	50	20	--	--	--	--	50
3	1BME3	III	Human Physiology and Physiological Modelling	4	-	4	3	40	10	50	20	--	--	--	--	50
4	1BME4	IV	Principles of Communications	4	-	4	3	40	10	50	20	--	--	--	--	50
5	1BME5	P-I	Practical I - LAB I	-	6	6	--	--	--	--	--	40	10	50	20	50
6	1BME6	P-II	Practical II - LAB II	-	6	6	--	--	--	--	--	40	10	50	20	50
			Total	16	12	28				200				100		300
Semester-II																
1	2BME1	V	Signals Systems and Networks	4	-	4	3	40	10	50	20	--	--	--	--	50
2	2BME2	VI	Bio-medical Instrumentation	4	-	4	3	40	10	50	20	--	--	--	--	50
3	2BME3	VII	Sensors and Measuring Techniques	4	-	4	3	40	10	50	20	--	--	--	--	50
4	2BME4	VIII	Multimedia and Medical Informatics	4	-	4	3	40	10	50	20	--	--	--	--	50
5	2BME5	P-III	Practical - III LAB –III	-	6	6	--	--	--	--	--	40	10	50	20	50
6	2BME6	P-IV	Practical - IV LAB –IV	-	6	6	--	--	--	--	--	40	10	50	20	50
			Total	16	12	28				200				100		300
															Grand Total of Semester-I & II	600

Appendix-C

Scheme of Teaching and examination for the Post Graduate Diploma in Computer Maintenance (One Year - Semester Pattern)

Sr. No.	Sub. Code No.	Paper / Practical No.	Subject	Teaching Scheme			Examination Scheme									Grand Total
							Theory					Practical				
				Theory	Practical	Total Periods / week	Duration of Papers (Hrs.)	Max. Marks Theory Papers	Max.Marks Internal Assessment	Total	Min. Pass Marks	Max. Marks	Max. Marks Internal Assessment	Total	Min. Pass Marks	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Semester-I																
1	1 CPMS 1	I	Basic Analog Electronics	4	-	4	3	40	10	50	20	--	--	--	--	50
2	1 CPMS 2	II	Basic Digital Electronics	4	-	4	3	40	10	50	20	--	--	--	--	50
3	1 CPMS 3	III	Computer Organization	4	-	4	3	40	10	50	20	--	--	--	--	50
4	1 CPMS 4	IV	Microprocessor & Interfacing	4	-	4	3	40	10	50	20	--	--	--	--	50
5	1 CPMS 5	P-I	Practical I - LAB I	-	6	6	--	--	--	--	--	40	10	50	20	50
6	1 CPMS 6	P-II	Practical II - LAB II	-	6	6	--	--	--	--	--	40	10	50	20	50
			Total	16	12	28				200				100		300
Semester-II																
1	2 CPMS 1	V	C language with ALP	4	-	4	3	40	10	50	20	--	--	--	--	50
2	2 CPMS 2	VI	Data Communication, Networking & Internet	4	-	4	3	40	10	50	20	--	--	--	--	50
3	2 CPMS 3	VII	Networking & Internet	4	-	4	3	40	10	50	20	--	--	--	--	50
4	2 CPMS 4	VIII	PC Maintenance & Trouble shooting	4	-	4	3	40	10	50	20	--	--	--	--	50
5	2 CPMS 5	P-III	LAB –III	-	6	6	--	--	--	--	--	40	10	50	20	50
6	2 CPMS 6	P-IV	LAB-IV	-	6	6	--	--	--	--	--	40	10	50	20	50
			Total	16	12	28				200				100		300
															Grand Total of Semester-I & II	600

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI

DIRECTION

No. : 5 of 2013 Date: 09/05/2013

Subject : Corrigendum to Direction in respect of Examinations leading to the Post-Graduate Diploma in (i) Mechatronics, (ii) Bio-Medical Electronics, and (iii) Computer Maintenance [Semester Pattern.....One Year (Full Time) P.G. Diploma Course] in the faculty of Science, Direction, 2013.

Whereas, Direction No.13 of 2012 in respect of Examinations leading to the Post-Graduate Diploma in (i) Mechatronics, (ii) Bio-Medical Electronics, and (iii) Computer Maintenance [Semester Pattern((One Year) (Full Time) P.G. Diploma Course in the Faculty of Science, is in existence in the University.

AND

Whereas, the provision regarding ñon job trainingò is already in existence in the syllabi of P.G.Diploma in (i) Mechatronics, (ii) Bio-Medical Electronics in lieu of Second Semester for which distribution of marks was not prescribed in the scheme of examination.

AND

Whereas, taking into consideration the need of establishing the scheme of awarding the marks for ñon job trainingò, the Academic Council in its meeting held on 18.4.2013 vide item No.2 H) in respect of recommendations of Faculty of Science, accepted the distribution of marks for ñon job trainingò and resolved to refer the matter to Ordinance Committee.

AND

Whereas, the matter is required to be regulated by framing the Ordinance and making of an Ordinance may likely to take some time.

AND

Whereas, the student appearing for ñon job trainingò in lieu of Second Semester in the academic session 2012-13 shall require the distribution of marks.

Now, therefore, I, Dr.Mohan K.Khedkar, Vice-Chancellor of Sant Gadge Baba Amravati University, Amraviati in exercise of powers conferred upon me under sub-section (8) of section 14 of the Maharashtra Universities Act, 1994, do hereby direct as under:

1) This Direction may be called, ñCorrigendum to Direction in respect of Examinations leading to the Post-Graduate Diploma in (i) Mechatronics, (ii) Bio-Medical Electronics, and (iii) Computer Maintenance [Semester Pattern.....One Year (Full Time) P.G. Diploma Course] in the Faculty of Science, Direction, 2013ò

2) This Direction shall come into force w.e.f. the date of its issuence.

3) In Direction No.13 of 2012, at the end of Appedix-A & B in respect of Schemes of Examinations leading to the Post-Graduate Diploma in (i) Mechatronics, (ii) Bio-Medical Electronics, the following note and scheme for distribution of marks be added.

ñNote : After completion of first semester, students have to complete either second semester or the on job training in company.ò

On job training - Total marks 300

Date : 7/5/2013

Sd/-
(Dr. M. K. Khedkar)
Vice-Chancellor

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI

DIRECTION

No. : 1 of 2014 Date: 21/ 02 / 2014

Subject : Corrigendum to Direction No. 13 of 2012 in respect of Examinations leading to the Post-Graduate Diploma in (i) Mechatronics, (ii) Bio-Medical Electronics, and (iii) Computer Maintenance [Semester Pattern.....One Year (Full Time) P.G. Diploma Course] in the faculty of Science, Direction, 2013.

Whereas, Direction No.13 of 2012 in respect of Examinations leading to the Post-Graduate Diploma in (i) Mechatronics, (ii) Bio-Medical Electronics, and (iii) Computer Maintenance [Semester Pattern((One Year) (Full Time) P.G. Diploma Course in the Faculty of Science, is in existence in the University.

AND

Whereas, the B.O.S. in Electronics in its meeting held on 28.8.2013 while considering the item in respect of Proposals regarding changes in Syllabi resolved to recommend the changes in the syllabi of P.G.Diploma in **(i)** Mechatronics, (ii) Bio-Medical Electronics to be implemented from the Academic Session 2013-14.

AND

Whereas, the Honôble Vice-Chancellor has accepted the above recommendations of B.O.S. u/s 14(7) of the Maharashtra Universities Act, 1994 on behalf of Faculty of Science on dated 30.8.2013.

AND

Whereas, the Academic Council in its meeting held on 31.8.2013 has approved the above recommendations.

AND

Whereas, the above changes in syllabi are related to change in the paper title which are prescribed in Appendices-A & B appended to Direction No.13 of 2012.

AND

Whereas, the matter is required to be regulated by framing the Ordinance and making of an Ordinance may likely to take some time.

AND

Whereas, the changes are to be made applicable from the Academic Session 2013-14.

Now, therefore, I, Dr.Jaikiran Tidke, Vice-Chancellor of Sant Gadge Baba Amravati University, Amravati in exercise of powers conferred upon me under sub-section (8) of section 14 of the Maharashtra Universities Act, 1994, do hereby direct as under:

1) This Direction may be called, ñCorrigendum to Direction in respect of Examinations leading to the Post-Graduate Diploma in (i) Mechatronics, (ii) Bio-Medical Electronics, and (iii) Computer Maintenance [Semester Pattern.....One Year (Full Time) P.G. Diploma Course] in the Faculty of Science, Direction, 2014ò

2) This Direction shall come into force w.e.f. the date of its issuance.

3) In Direction No.13 of 2012, in Appendix-A in respect of Scheme of Examinations leading to the Post-Graduate Diploma in Mechatronics,

   i) The title of Paper 1MCH2, ówery Large Scale Integrated Circuit Designôbe substituted by the title óRobotics and Applicationsô.

   ii) The title of Paper 1MCH4, óElectronics Manufacturing Technologyôbe substituted by the title óProcess Controlô.

4) In Direction No.13 of 2012, in Appendix-B in respect of Scheme of Examinations leading to the Post-Graduate Diploma in Bio-Medical Electronics, the title of Paper 1BME4, óPrinciples of Communicationsô be substituted by the title óBiomedical Instrumentationô.

Date : 20/2/2014

(Dr.Jaikiran Tidke)
Vice-Chancellor
Sant Gadge Baba Amravati University

SYLLABUS PRESCRIBED FOR POST GRADUATE DIPLOMA IN MECHATRONICS

SEMESTER-I

PAPER I

1MCH1 : Embedded System and Design

UNIT-I : **BASICS OF EMBEDDED SYSTEMS AND HARDWARE REQUIREMENTS :** Introduction - Examples of embedded systems: Telegraph - Cordless bar - Code scanner - Laser printer -Underground tank monitoring - Nuclear Reactor monitor. Advanced hardwares: Programmable array logic;

Application Specific Integrated circuits (ASIC) and Field Programmable Gate arrays (FPGA) - Watch dog timers- Built - Ins on the microprocessor - Interrupt.

UNIT-II : **EMBEDDED SOFTWARE ARCHITECTURE:** Round robin - Round robin with interrupts - Function Queue scheduling Architecture - Real time operating systems Architecture - Selecting architecture

REAL TIME OPERATING SYSTEM: Tasks and Task states - Tasks and Data - Semaphore and shared data - Timer functions - Events - Memory management - Interrupt routines in an RTOS Environment.

Design of an embedded system.

UNIT-III : **EMBEDDED SOFTWARE DEVELOPMENT TOOLS AND DEBUGGING :** Linker/Locators for embedded software - embedded software in to the target system - Testing on host machine:Basic techniques - more advanced techniques - Limitations and shortcomings - Instruction set simulators ï The assert macro - Testing using laboratory tools.

UNIT-IV : **Mechatronics :** Defination, design process, **Closed loop Controllers**: continuous and discrete control processes , Terminology , Two step mode , Proportional mode , Derivative control , Integral control , PID controller , Digital controllers , Controller tuning , velocity control, Adaptive control.

UNIT-V : **Programmable Logic Controller:** Programmable logic controller , basic PLC structure , I/P- O/ P Processing , Ladder programming, Instruction lists ,latching and integral relays , sequencing , timers and Counters, Shift registers, Master and jump controls, data handling.ò

Text Book :

1) David E. Simon, An embedded software primer, Addition - Wesley 1999.
2) W Bolten (4th Edition) Mechatronics

PAPER II

1MCH2 : Robotics and Applications

UNIT-I : Introduction to Robotics. Basic robotic parameters- Robot classification based on drive technologies, work envelope, motion control methods & application based. Number of axis, capacity & speed. Reach & stroke, tools & applicators. Work volume, repeatability, precision & accuracy.

UNIT-II : **INTRODUCTION TO TRANSDUCER**ï Sensors used in Robotics - Function & use of sensors in robotics. Tactile sensors, Micro switches, strain gauges, Non contact sensors ï capacitive, inductive and ultrasonic, laser sensors. Temperature transducer 1] Thermocouple, 2] RTD, 3] Thermistor 4] Radiation Pyrometer. Pressure transducer ï 1] Piezo-resistive, 2] Bellows. 3] Vibration transducer ï seismic transducer, piezo-electric Accelerometer. Displacement & Obstacle sensing, LVDT, Optical diffusion & proxy sensors.

UNIT-III : Robot Motion Analysis & Control -1] Position representation. 2] Forward and reverse transformation with 2 degrees of freedom specific to Arm rotation. 3] Composite homogeneous transformation. 4] Screw transformation. 5] Link coordinate & arm matrix. Robot End Effectors - Types & function of gripper. Study of magnetic vacuum and mechanical grippers. Design and function of different type of end effectors, Tool as end effectors. Gripper specification & design consideration.

UNIT-IV : Pneumatics & Hydraulics Valves, Actuators, Motors. Pneumatic & Hydraulic circuits. Pneumatic & Hydraulic motion control.

UNIT-V : Robot Applications- Material handling, process operation and inspection, machine loading and unloading, spot & arc welding. Spray painting, marine applications, laser cutting, future applications.

Text Books:

1. Automation and Robotics by Miltiadis A. Roboulos
2. Industrial Robotics: Theory, modelling and Control by Sam Cubero

3. Advances in Robot Manipulator by Ernest Hall
4. Robot Builderôs Bonanza 4@ by Gordon McComb, Myke Predko

LAB-I :

PRACTICALS : Atleast 8 practicals to be performed by each student based on paper I & II

PAPER III

1MCH3 : Digital Image Processing

UNIT I : **DIGITAL IMAGE FUNDAMENTALS :-** Elements of digital image processing systems, Elements of Visual preception, Image sampling and quantization, Matrix amd Singular Value representaion of discrete images.

UNIT II : **IMAGE TRANSFORMS :-** 1D DFT, 2D DFT, Cosine, Sine, Hadamard, Haar, Slant, KL, SVD transforms and their properties.

UNIT III : **IMAGE ENHANCEMENT** :- Histogram Modification and specification techniques, Image smoothing, Image sharpening, generation of spatial masks from frequency domain specification, Nonlinear filters, Homomorphic filtering, false color, Pseudocolor and color image processing.

UNIT IV : **IMAGE RESTORATION AND RECOGNITION:-** Image degradation models, Unconstrained and Constrained restoration, inverse filtering, Least mean square filter, Pattern Classes, optimal statistical classifiers, Neural networks and associated training methods and use of neural networks in image processing.

UNIT V : **IMAGE COMPRESSION :-** Runlength, Huffman coding, Shift codes, arithmetic coding, bit plane coding, transform coding, JPEG Standard,wavelet transform, predictive techniques, Block truncation coding schemes, Facet modeling.

Text Books:

1. Anil K. Jain, ñFUNDAMENTALS OF DIGITAL IMAGE PROCESSING ñ, Prentice Hall of India, 1997.
2. Rafel C.Gonzalez and Richard E.Woods, ñ DIGITAL IMAGE PROCESSING ñ, Addison Wesley, 1993.

References:

1. William K. Pratt, ñDIGITAL IMAGE PROCESSING ñ, John Wiley, NY, 1987.
2. Sid Ahmed M.A., ñIMAGE PROCESSING THEORY, ALOGORITHMS AND ARCHITECTURES ñ, McGraw-Hill, 1995.
3. Umbaugh, ñCOMPUTER VISION ñ.

PAPER IV

1MCH4 : Process Control

UNIT-I : Physical parameters involved in Process control Level, Flow, Temp. & Pressure. Sensors used in sensing process parameters. Contact & Non contact type level sensors. Flow sensors ï Orifice, Ventury, Optical, Electromagnetic, Turbine type, Ultrasonic. Pressure sensors ï Piezo electric, Temp. Sensors- RTD, Thermo-couple, Thermistor & Radiation type. Differential Pressure transmitters, Square root extractor

UNIT-II : Monitoring & Display system - Analog & Digital meters. Multi range & Multi-parameter meters. Power Analyzers, Bar graphs & graphical displays.

UNIT-III : Non electrical Measurement system. Rotameter, Nozel & pitot tubes, Manometers, Float type & Air purge method of level measurement. Bimetalic thermometers, mercury/ Alcohol in glass thermometers

UNIT-IV : Open loop & Close loop (Feed-back) control systems. On-OFF & Linear control. Proportional control, P-I Control PID control. Process tuning (Ziglar-Nicolus & Quarter wave method) Multi-loop control systems (Ratio & Cascade control).

UNIT V : Process Automation. Analog & Digital Control. Discrete Digital control, PC interface, ADC & DAC, PLC based automation. Distributed control system. Different languages of PLC programming. Human Machine Interfacing. SCADA. Wireless Industrial communication. Process plant , Batch process reactor & 3 term Boiler automation.ò

Text Books:

1. Fundamental of Industrial Instrumentation and Process Control by Willium C. Dunn
2. Process equipment Malfunction by Norman P. Liberman
3. Fundamentals of ProgrammableLogic Controllers, sensors and communication by John Stenerson
4. Data Communication for Instrumentation and control by John Park, Steve Mackay, Edwin Weight

LAB II:

PRACTICALS: Atleast 8 practicals to be performed by each student based on paper III & IV

SYLLABUS PRESCRIBED FOR POST GRAGUATE DIPLOMA IN MECHATRONICS

SEMESTER- II

PAPER V

2MCH1 : Finite Element Techniques

UNIT-I : **INTRODUCTION - VARIATIONAL FORMULATION** General field problems in Engineering - Modelling - Discrete and Continuous models - Characteristics - Difficulties involved in solution - The relevance and place of finite element method - Historical comments - Basic concept of FEM. Boundary and initial value problems - Gradient and divergence theorems - Functionals - Variational calculus - Variational formulation of VBPS. The method of weighted residuals - The Ritz method.

UNIT-II : **FINITE ELEMENT ANALYSIS OF ONE DIMENSIONAL PROBLEMS** One dimensional second order equations - discretisation of domain into elements - Generalised coordinates approach - derivation of elements equations - assembly of element equations - imposition of boundary conditions - solution of equations - Cholesky method - Post processing - Extension of the method to fourth order equations and their soultions - time dependant problems and their solutions - example from heat transfer, fluid flow and solid mechanics.

UNIT-III : **FINITE ELEMENT ANALYSIS OF TWO DIMENSIONAL PROBLEMS** Second order equations involving a scalar-valued function - model equation - Variational formulation ï Finite element formulation through generalised coordinates approach - Triangular elements and quadrilateral elements - convergence criteria for chosen models - Interpolation functions - Elements matrices and vectors - Assembly of element matrices - boundary conditions - solution techniques.

UNIT-IV : **ISOPARAMETRIC ELEMENTS AND FORMULATION** Natural coordinates in 1,2 and 3 dimensions - use of area coordinates for triangular elements in - 2 dimensional problems - Isoparametric elements in 1,2 and 3 dimensions - Largrangean and serendipity elements - Formulation of element equations in one and two dimensions - Numerical integration.

UNIT-V : **APPLICATIONS TO FIELD PROBLEMS IN TWO DIMENSIONS** Equations of elasticity- plane elasticity problems - axisymmetric problems in elasticity - Bending of elastic plates - Time dependent problems in elasticity - Heat - transfer in two dimensions - incompressible fluid flow. Three dimensional problems - Mixed formulation - use of software packages.

Text Book:

1. J.N.Reddy, ñ An Introduction to Finite Element Method ñ, McGraw Hill, Intl. Student Edition, 1985.

References:

1. Rienkiewics, ñ The finite element method, Basic formulation and linear problems ñ, Vol.1, 4/e, McGraw Hill, Book Co.
2. S.S.Rao, ñ The Finite Element Method in Engineering ñ, Pergaman Press, 1989.
3. C.S.Desai and J.F.Abel, ñ Introduction to the Finite Element Method ñ, Affiliated East west Press, 1972.

PAPER VI

2MCH2 :Industrial Tribology

UNIT–I : **SURFACES AND FRICTION :-** Topography of Engineering surfaces- Contact between surfaces - Sources of sliding Friction ï Adhesion Ploughint- Energy dissipation mechanisms Friction Characteristics of metals - Friction of non metals. Friction of lamellar solids - friction of Ceramic materials and polymers - Rolling Friction - Source of Rolling Friction ï Stick slip motion - Measurement of Friction.

UNIT–II : **WEAR:-** Types of wear - Simple theory of Sliding Wear Mechanism of sliding wear of metals - Abrasive wear ï Materials for Adhesive and Abrasive wear situations - Corrosive wear - Surface Fatigue wear situations - Brittle Fracture wear - Wear of Ceramics and Polymers - Wear Measurements.

UNIT–III : **LUBRICANTS AND LUBRICATION TYPES:-** Types and properties of Lubricants - Testing methods - Hydrodynamic Lubrication - Elasto hydrodynamic lubrication- Boundary Lubrication - Solid Lubrication Hydrostatic Lubrication.

UNIT–IV : **FILM LUBRICATION THEORY:-** Fluid film in simple shear - Viscous flow between very close parallel plates - Shear strress variation Reynolds Equation for film Lubrication - High speed unloaded journal bearings - Loaded journal bearings ï Reaction torque on the bearings - Virtual Co-efficient of friction - The Somerfield diagram.

UNIT–V : **SURFACE ENGINEERING AND MATERIALS FOR BEARINGS :-**
Surface modifications - Transformation Hardening, surface fusion - Thermo chemical processes ï Surface coatings - Plating and anodizing - Fusion Processes - Vapour Phase processes - Materials for rolling Element bearings - Materials for fluid film bearings - Materials for marginally lubricated and dry bearings.

Text Book:

1. I.M. Hutchings, Tribology, ñFriction and Wear of Engineering Material ñ, Edward Arnold, London, 1992.

References:

1. T.A. Stolarski, ñTribology in Machine Design ñ, Industrial Press Inc., 1990.
2. E.P.Bowden and Tabor.D., ñ Friction and Lubrication ñ, Heinemann Educational Books Ltd., 1974.
3. A.Cameron, ñBasic Lubrication theory ñ, Longman, U.K.., 1981.
4. M.J.Neale (Editor), ñ Tribology Handbook ñ, Newnes. Butter worth, Heinemann, U.K., 1975.

LAB III

PRACTICALS : Atleast 8 practicals to be performed by each student based on paper V & VI

PAPER VII

2MCH3 : Design for Manufacture

UNIT–I : **DFMN APPROACH AND PROCESS** Methodologies and tools, design axioms, design for assembly and evaluation, minimum part assessment taquchi method, robustness assessment, manufacturing process rules, designerôs tool kit, Computer Aided group process rules, designerôs tool kit, Computer Aided group Technology, failure mode effective analysis, Value Analysis. Design for minimum number of parts, development of modular design, minimising part variations, design of parts to be multi-functional, multi-use, ease of fabrication, Poka Yoka principles.

UNIT–II : **GEOMETRIC ANALYSIS** Process capability, feature tolerance, geometric tolerance, surface finish, review of relationship between attainable tolerence grades and difference machining processes. Analysis of tapers, screw threads, applying probability to tolerences.

UNIT–III : **FORM DESIGN OF CASTINGS AND WELDMENTS** Redesign of castings based on parting line considerations, minimising core requirements, redesigning cast members using weldments, use of welding symbols

UNIT–IV : **MECHANICAL ASSEMBLY** Selective assembly, deciding the number of groups, control of axial play, examples, grouped datum systems - different types,

geometric analysis and applications-design features to facilitate automated assembly.

UNIT–V : TRUE POSITION THEORY

. Virtual size concept, floating and fixed fasterners, projected tolerance zone, assembly with gasket, zero true position tolerance, functional gauges, paper layout gauging, examples. Operation sequence for typical shaft type of components. Prepration of process drawings for different operations, tolerence worksheets and centrality analysis, examples.

Text Books:

1. Harry Peck, ñDesigning for Manufacture ñ, Pitman Publications, 1983.
2. Matousek, ñEngineering Design, - A Systematic Approachò - Blackie & Son Ltd., London, 1974.

References:

1. Sports M.F.., ñ Dimensioning and Tolerence for Quantity Production ñ, Prentice Hall Inc., 1983.
2. Oliver R. Wade, ñ Tolerence Control in Design and Manufacturing ñ, Industrial Press Inc. New York Publications, 1967
3. James G. Bralla, ñ Hand Book of Product Design for Manufacturing ñ, McGraw Hill Publications, 1983.
4. Trucks H.E., ñDesign for Economic Production ñ, Society of Manufacturing Engineers, michigan, 2nd edition, 1987.

PAPER VIII
2MCH4 : Real Time Operating System

UNIT–I : INTRODUCTION : Real Time System - Embedded Systems - Pervasive Computing - Information Access Devices - Smart Cards - Embedded Controllers - Hardware Fundamentals.

UNIT–II : RTOS Real Time Operating Systems - Memory Management - Processes, Threads, Interrupts, Events - User Interface.

UNIT–III : REAL TIME UML Requirements Analysis - Object identification strategies - Object Behavior - Real Time Design Patterns.

UNIT–IV : SOFTWARE DEVELOPMENT Concurrency - Exceptions - Tools - Debugging Techniques - Optimization - Case Studies.

UNIT–V : CONNECTIVITY

Wireless Connectivity - Blue Tooth - Other Short Range Protocols - Wireless Application Environment ï Service Discovery - Middleware.

References :

1. R.J.A.Buhr, D.L.Bailey, ñAn Introduction to Real Time Systemsò, Prentice-Hall International, 1999.
2. B.P.Douglass, ñReal Time UML 2nd Editionò, Addison-Wesley, 2000.
3. D.E.Simon, ñAn Embedded Software Primerò, Addison-Wesley, 1999.
4. J.Schiller, ñMobile Communicationsò, Addison-Wesley, 2000.
5. V.Hansmann, L.Merk, M.S.Nicklous, T.Stober, ñPrevasive Computing Handbookò, Springer, 2001.

Project : Based on above syllabus.

NOTE : After completion of first semester, Students have to complete either second semester or the on job training in company.

1.	Marks on Academic Performance		- 50
	a)	Attendance	- 10
	b)	Knowledge of concepts	- 10
	c)	Intellectual Ability	- 05
	d)	Decision making ability	- 05
	e)	Skill for handling the task	- 10
	f)	Co-operation/leadership qualities	- 05
	g)	Sense of Responsibility	- 05
2.	Presentation and Demonstration of the Project Completed during training.		- 100
3.	Viva-voce (Internal at industries)		- 50
4.	Evaluation of Project (External)		- 100

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SYLLABUS PRESCRIBED FOR P. G. DIPLOMA IN BIO-MEDICAL ELECTRONICS

SEMESTER- I

Paper I

1BME1 : MEDICAL PHYSICS

UNIT-I : **ATOMIC PHYSICS :-** Traditional definition of atom, periodic system of elements, mechanical properties of atom, emission of light and its frequencies. Electromagnetic spectra.Principles of Nuclear Physics - Natural radioactivity, Decay series, type of radiation and their applications, artificially produced isotopes and its application, accelerator principles; Radionuclides used in Medicine and technology.

UNIT-II : **INTERACTION WITH LIVING CELLS :-** Target theory, single hit and multi target theory, cellular effects of radiation, DNA damage, depression of Macro molecular synthesis, Chromosomal damage.

UNIT-III : **SOMATIC EFFECT OF RADIATION :-** Radio sensitivity protocol of different tissues in human, LD 50/30 effect of radiation on skin, blood forming organs, lenses of eye, embryo and Endocrinal glands.

UNIT-IV : **GENETIC EFFECT OF RADIATION :-** Threshold of linear dose effect, relationship, factors affecting frequency of radiation induced mutation, Gene controlled hereditary diseases, biological effect of microwave and RF wave. Variation in dielectric constant and specific conductivity of tissues. Penetration and propagation of signals effects in various vital organs, Protection standards.

UNIT-V : **PHOTO MEDICINE :-** Synthesis of Vitamin D in early and late cutaneous effects, Phototherapy, Photo hemotherapy, exposure level, hazards and maximum permissible exposures.

LASER PHYSICS - Characteristics of Laser radiation, Laser speckle, biological effects, laser safety management.

TEXT BOOKS

1. Moselly, "Non ionising Radiation"Adam Hilgar Brustol 1988
2. Branski.S and Cherski.P "Biological effects of Microwave"Hutchinson & ROSS Inc. Strondsburg 1980

REFERENCES

1. Glasser.O.Medical Physics Vol. 1,2,3 year Book Publisher Inc Chicago, 1980

PAPER II

1BME2 : MICROPROCESSOR, MICROCONTROLLER AND COMPUTER APPLICATIONS IN MEDICINE

UNIT-I : **8-BIT MICROPROCESSOR AND 80X86 PROCESSORS:**

8085 Architecture and Memory interfacing, interfacing I/O devices, Instruction set, Addressing Modes, Assembly language programming, counters and time delays, interrupts, timing diagram, Microprocessor applications. 8086 Architecture, Pin Configuration, 8086 Minimum and Maximum mode configurations, Addressing modes, Basic Instructions, 8086 Interrupts, Assembly levels programming. Introduction to 80186, 80286,80386, 80486 and Pentium processors.

UNIT-II : **MICROPROCESSOR PERIPHERALS AND INTERFACING:**

Serial and parallel I/O (8251 and 8255), Programmable DMA Controller (8257), Programmable interrupt controller (8259), keyboard display controller (8279), ADC/DAC interfacing. Inter integrated circuits interfacing (I^2C standard).

Interfacing to alpha numeric displays, interfacing to liquid crystal display (LCD 16 x 2 line), high power Devices and Optical motor shaft encoders, stepper motor interfacing, Analog interfacing and industrial control, microcomputer based smart scale, industrial process control system, Robotics and Embedded control, DSP and Digital Filters.

UNIT-III : **MICROCONTROLLER:-** Intel 8031/8051 Architecture, Special Function Registers (SFR), I/O pins, ports and circuits, Instruction set, Addressing Modes, Assembly Language Programming, Timer and Counter Programming, Serial Communication, Connection to RS 232, Interrupts Programming, External Memory interfacing, Introduction to 16 bit Microcontroller

UNIT-IV : **SYSTEM DESIGN& COMPUTERS IN PATIENT MONITORING :** Multichannel computerised ECG, EMG and EEG data acquisition, storage and retrieval, transmission of signal and images.

Physiological monitoring, automated ICU, computerised arrhythmia monitoring, information flow in a clinical lab, computerised concepts, interfacing to HIS.

UNIT-V : COMPUTERS IN MEDICAL*SYSTEMS MODELLING & RESEARCH :- Radiotherapy, drug design, drug delivery system, physiological system modelling and simulation. Role of expert systems, pattern recognition techniques in medical image classification, ANN concepts.

REFERENCES

1) R.DJLee, ñComputers in Medicineò, Tata McGraw-Hill, New Delhi, 1999.
2) Douglas V.Hall, ñMicroprocessors and Interfacing : Programming and hardwareò, McGraw-Hill, Singapore, 1999.

LAB-I

PRACTICALS : Atleast 8 practicals to be performed by each student based on paper I & II

PAPER III

1BME3 : HUMAN PHYSIOLOGY & PHYSIOLOGICAL MODELLING

UNIT-I : CELL , CARDIAC AND NERVOUS SYSTEM :- Structure of Cell - Function of each Components of the cell - Membrane Potential - Action Potential -

Generation and Conduction - Electrical Stimulation, Blood Cell - Composition - Origin of RBC - Blood Groups - Estimation of RBC, WBC and platelet. Cardiac Cycle - ECG - Blood Pressure - Feedback Control for Blood Pressure - Nervous control of Heart. Cardiac output - Coronary and Peripheral Circulation - Structure and function of Nervous tissue - Reflex action - Velocity of Conduction of Nerve Impulses. Electro Encephalograph - Autonomic Nervous System.

UNIT-II : RESPIRATORY, DIGESTIVE AND EXCRETORY SYSTEM:-

Physiological aspects of respiration. Exchange of gases - Regulation of Respiration. Disturbance of respirating function. Pulmonary function test. Organization of GI system, Digestion

and absorption - Movement of GI tract - Structure of Nephron - Mechanism of Urine formation - Urine Reflex - Skin and Sweat Gland - Temperature regulation.

UNIT-III : SPECIAL SENSES :- Optics of Eye - Retina - Photochemistry of Vision - Accommodation Neurophysiology of Vision - EOG. Physiology of Internal Ear - Mechanism of Hearing - Auditory pathway, Hearing Tests.

UNIT-IV : INTRODUCTION & TRANSFER FUNCTIONS : System concept, system properties, piece-wise linear approximation, electrical analog for compliance, thermal storage, pulse response of first order systems, response of resistant and compliance system. Transfer functions and its use, engineering concept in coupled system, example of Transformed signals.

UNIT-V : IMPEDANCE CONCEPT FEEDBACK SYSTEMS SIMULATION OF BIOLOGICAL SYSTEMS:- Circuits for the Transfer function with impedance concept, prediction of performance, periodic signals. Characteristics of physiological feedback systems, uses and testing of system stability. Simulation of thermal regulation, pressure and flow control in circulation, occulo motor system, endocrinal system, functioning of receptors.

REFERENCES

1. William B.Blesser, ñAS System approach to Bio-medicineò, McGraw-Hill book co., New York, 1969.
2. Manfreo clynes and John H.Milsum, ñBio-medical engineering systemò, McGraw-Hill book co., NewYork, 1970.
3. Douglas S.Regs, ñControl theory and physiological feedback mechanismò, The William & Williams co., Baltimore, 1970.
4. Arthur.C.Guyton - Textbook of Medical Physiology - Prism Book (p) Ltd. 1996.
5. Cyril A.Keele Eric Neil and Neil Norman Joels Samson WrigthsôApplied Physiology - Oxford University Press- 1983.

TEXTBOOK

1. Sarada Subramanyam, K.Madhavan Kutty and H.D.Singh - Text book of ôHuman Physiologyô-S.Chand & Company, 1996.
2. Sujit K.Chaudhuri - Concise Medical Physilogy - New Central Book agency, 1997. .

PAPER IV

1BME4 : Biomedical Instrumentation

Unit-I : Fundamentals of Biomedical Instrumentation: Basic medical instrumentationsystem , Performance requirements of Medical Instrumentation System, Intelligent Medical Instrumentation System, biometrics.

Unit-II : Bioelectric Signals and Electrodes: Origin of Bioelectric signals , Recording Electrodes , Silver- Silver Chloride Electrodes , Electrodes for ECG , EEG and EMG.

Unit-III : Biomedical Recorders: Electrocardiograph (ECG), vectorcardiograph (VCG), Phonocardiograph (PCG), Electroencephalograph (EEG) , Electromyograph (EMG), cardiac pacemakers .

Unit-IV : Magnetic Resonance Imaging System : Principles of NMR Imaging System , Image Reconstruction Techniques , Basic NMR Components , Biological Effect of NMR Imaging , Advantages of NMR , Imaging System ,principle of MRI.

Unit-V : Radio-therapy Equipment : Use of high voltage X-ray Machines , Development of Betatron , Cobolt-60 Machine , Medical Linear Accelerator Machine , X-ray tomography, short wave , micro-wavand surgical diathermy. ñ

Text Book:

R. S. Khandpur (2nd Addition) (McGraw Hill publication) : Biomedical Instrumentation

REFERENCES:

1) B.P.Lathi, óAnalog and Digital Communication Systemsô, PHI, 1992.
2) Proakis,ôDigital Communicationô, McGraw-Hill, 1992.
3) A.B.Carlson, óCommunication SystemsôMcGraw-Hill, 1992.
4) K.Sam Shanmugam,ôDigital and Analog Communication Systems, John Wiley, 1985.

LAB II

PRACTICALS: Atleast 8 practicals to be performed by each student based on paper III & IV

SYLLABUS PRESCRIBED FOR P. G. DEGREE IN BIO-MEDICAL ELECTRONICS

Semester II

PAPER V

2BME1 : SIGNALS SYSTEMS AND NETWORKS

UNIT–I : CLASSIFICATION OF SIGNALS AND SYSTEMS & ANALYSIS OF CT SIGNALS: Continuous time signals (CT signals), Discrete time signals (DT signals)- Step, Ramp, Pulse, Impulse, Exponential, Classification of CT and DT signals- Periodic and Aperiodic, random signals, CT systems and DT systems, Classification of systems - Linear Time invariant systems. Courier series analysis, Spectrum of CT signals, Fourier Transform and Laplace Transform in Signal analysis.

UNIT–II : LTI - CT SYSTEMS & ANALYSIS OF DT SIGNALS : Differential equation, Block diagram representation, Impulse response, Convolution integral, Frequency esponse, Fourier Methods and Laplace transforms in analysis, State equations and Matrix. Spectrum of DT signals, Discrete Time Fourier Transform (DTFT), Discrete Fourier Transform (DFT), properties of Z-transform in signal analysis.

LTI - DT SYSTEMS : Difference equations, Block diagram representation, Impulse response, Convolution SUM, Frequency Åesponse, FFT and Z-transform analysis, State variable equation and Matrix.

UNIT–III : BASICS OF CIRCUIT ANALYSIS & NETWORK THEOREMS AND RESONANCE CIRCUITS:- EGrchoff s Laws, DC and AC excitation, series and parallel circuits, sinusoidal steady state analysis, Mesh current and Node Voltage method of Analysis, Matrix method of Analysis. Theveninôs and Nortonôs theorems, Superposition theorem, Compensation theorem, Reciprocity theorem, Maximum power transfer theorem, series and parallel resonance, Quality factor and Bandwidth.

UNIT–IV : ANALYSIS OF NETWORKS:- Network elements, Transient response of RL, RC and RLC Circuits to DC excitation, Natural and forced Oscillations, Two-port Networks, Parameters and transfer function, Interconnection of two-ports.

UNIT-V : **ELEMENTS OF NETWORK SYNTHESIS :-**Network readability, Hurwitz polynomials, Positive real functions, Properties of RL, RC md LC Networks, Foster and Cauer forms of Realization, Transmission Zeroes, synthesis rf transfer functions

TEXT BOOKS

1. A. Sudhakar, Shyammohan S. Palli, ñCircuits and Networks Analysis and Synthesisò, Second Edition, Tata McGraw-Ôkill, 2002. Unit (I - IV)
2. Vasudev. K. Aartre, ñNetwork Theory and Filter Designò, Wiley - Eastern Ltd, Second Edition, 1993. (Unit V)
3. Allan V. Oppenhein et al, ñSignals and Systemsò, Prentice Hall of India Pvt. Ltd, 1997

PAPER VI

2BME2 : BIOMEDICAL INSTRUMENTATION

UNIT –I : **BIO-POTENTIAL ELECTRQDES :-** Electrode electrolyte interface, half-cell potential, polarisation and non- polarisable electrode, calomel electrode, needle and wire electrode, microelectrode-metal micropipete.

UNIT –II : **RECORDING SYSTEM :-** Low-Noise preamplifier, main amplifier and driver amplifier, inkjet recorder, thermal array recorder, photographic recorder, magnetic tape recorder, X-Y recorder, medical oscilloscope.

UNIT –III : **BIO-CHEMICAL MEASUREMENT :-** pH, pO_2, pCO2, $pHCO_3$, Electrophoresis, colorimeter, spectro photometer, flame photometer, auto analyser.

UNIT –IV : **NON-ELECTRICAL PARAMETER MEASUREMENTS :-** Respiration, heart rate, temperature, pulse blood pressure, cardiac output, O_2, CO2 measurements.

UNIT-V : **BLOOD FLOW AND BLOOD CELL COUNTING:-** Electromagnetic and ultrasonic blood flowmeter, indicator dilution method, thermodilution method, manual and automatic counting of RBC, WBC and platelets.

TEXTBOOK

1. Leslie Cromwell, ñBiomedical Instrumentation and measurementò, Prentice hall of India, New Delhi, 1997. *

REFERENCES

1. John G. Webster, ñMedical Instrumentation Application and Designò, John Wiley and sons, New York, 1998.
2. Khandpur R.S, ñHandbook of Biomedical Instrumentationò, Tata McGraw-Hill, New Delhi, 1997.
3. Joseph J.carr and John M. Brown, ñintroduction to Biomedical equipment technologyò, John Wiley and sons, New York, 1997.

LAB III

PRACTICALS : Atleast 8 practicals to be performed by each student based on paper V & VI

PAPER VII

2BME3 : SENSORS AND MEASURING TECHNIQUES

UNIT –I : **CONCEPTS OF MEASUREMENT:** Measurements, instrumentation, errors in measurements, calibration and standard.

TRANSDUCERS : Classification and characteristics of transducers, transducers for measurement of pressure, flow and temperature, optical sensors, acoustic sensors, DC and AC bridges.

UNIT–II : **SIGNAL GENERATORS AND SIGNAL ANALYSERS :-** AF generator, Pulse generator, AM/FM signal generators, Function generator, Sweep frequency generator, wave analyser, spectrum analyser, logic analyser, distortion analyser.

UNIT–III : **DIGITAL INSTRUMENTS :-** Digital Voltmeters and Multimeters, automation in Voltmeters, accuracy in DVM, Guarding techniques, Frequency, period, time interval and pulse width measurement. C R O , Single beam, dual trace, double beam CRO, storage CRO, sampling oscilloscope.

UNIT–V : **RECORDING SYSTEM:-** Analog and digital recorders, multichannel column display oscilloscope, magnetic recorder.

TEXTBOOK

1. Cooper, ñ Electronic Instrumentation and Measurement techniques ñ Prentice Hall of India, 1998.

REFERENCES

1. Doeblin, ñMeasurements Systems ñ, McGraw-Hill, 1990.
2. C. Barney, ñIntelligent Instrumentation ñ, Prentice hall of India, 1985.
3. C.S. Rangan ,ò Instrumentation Devices and Systemsò, Tata McGraw-Hill 1998.

PAPER VIII

2BME4 : MULTIMEDIA AND MEDICAL INFORMATICS

UNIT-I : **MEDICAL DATABASE IMPLEMENTATION :-** Medical data acquisition and database systems: PC based mutlichannel data acquisition system; storage, analysis and retrieval techniques.

UNIT –II : **VISUAL BASIC :-** Visual programming concepts; visual Basic environment, tools and controls; Dynamic data exchange; VB based Medical information System.

UNIT –III : **COMPUTERS IN SYSTEM DESIGN :-** Hospital Information System its design and functional characteristics; Principles and application of Artificial Intelligence, Pattern Recognition, Neural Network and Fuzzy Logic in Medicine.

UNIT –IV : **MULTIMEDIA AND VIRTUAL REALITY APPLIED TO MEDICINE :-** Basic concepts of Multimedia; Design of Multimedia information systems; Components of virtual reality; Virtual reality applications in medicine.

UNIT –V : **COMPUTERS IN MEDICAL RESEARCH :-**Medical Informatics and its levels; Design and development of educational packages on medical sciences; Integrated design concepts; Interactive multimedia, Virtual and digital libraries, Internet and its applications.

TEXTBOOK

1. R.D.Lele, ñComputer in Medicineò, Tata McGraw-Hill, New Delhi, 1997.

REFERENCES

1. TayVaughan, ñMultimedia making it workô, Tata McGraw-Hill, New Delhi, 1997.

2. Davis Chapman, ñTeach Yourself Visual Basic 6 in 21 daysò, New Delhi, 1997.
3. Harold Sackman, ñBiomedical Information Technology*, Academic Press, New York, 1997.
4. Mary Brth Fecko, ñElectronics Resources: Access and Issuesò, Bowker and Saur, London, 1997

LAB IV

PRACTICALS : Atleast 8 practicals to be performed by each student based on paper VII & VIII

NOTE : After completion of first semester, students have to complete either second semester or the on job training in company.

1.	Marks on Academic Performance	- 50
a)	Attendance	- 10
b)	Knowledge of concepts	- 10
c)	Intellectual Ability	- 05
d)	Decision making ability	- 05
e)	Skill for handling the task	- 10
f)	Co-operation/leadership qualities	- 05
g)	Sense of Responsibility	- 05
2.	Presentation and Demonstration of the Project Completed during training.	- 100
3.	Viva-voce (Internal at industries)	- 50
4.	Evaluation of Project (External)	- 100

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SYLLABUS PRESCRIBED FOR P.G. DIPLOMA IN COMPUTER MAINTENANCE

SEMESTER-I

PAPER I

1CPMS1 : Basic Analog Electronics

Unit I : **Passive Components and Network theorems :** Introduction of Resistor, Capacitor, Inductor and Transformer. Concept of ideal dc voltage and current source, Statements of KVL, KCL, Thevenin, Nortons, maximum power transfer, Millmanôs and superposition theorems (proofs, simple numerical applicable for dc only).

UNIT II : Measuring Instruments : Principles of voltmeter, ammeter, ohmmeter, Muitirange DC voltmeter ,ohm per volt rating, loading effect, Multirange DC Ammeter, Series & shunt type ohmmeter, Multimeter, (uses & drawback).CRO Block diagram & explanation, CRT construction &working, uses of CRO (measurement of frequency , amplitude & phase.)

Unit III : Semiconductor Diode and Regulated power supply : Operation and characteristics of PN junction, avalanche and Zener breakdown mechanism. Half wave and full wave rectifiers, ripple factor, efficiency, PIV ratings C,L and ð filters .Concept of unregulated and regulated power supply, Zener diode voltage regulator, Transistor series and shunt regulator, three terminal IC regulator.

Unit IV : Transistor: NPN and PNP transistor, (construction and working) , CB, CE & CC configuration, leakage currents, Input and output characteristics of CE mode, relation between á and â, Load line and operating point Amplification action of CE amplifier, biasing and stability, Self and fixed bias circuit.

Unit V: Memory : Concept of primary & secondary memory, memory hierarchy, classification of memories, Floppy disk, Winchesterdisk, CD, DVD. Semiconductor memories: RAM, ROM, PROM, EPROM, EAROM, and EEPROM.

Books Recommended :

1. Elements of Electronics by Bagade and Singh (S.Chand and company)
2. Electronic devices, application and integrated circuits by Mathur(Kulshrestha,Chadha,Umesh Publication)
3. Pulse, Digital, Switching wave forms by Millman and Taub (Mcgraw Hill-Kogakusha)
4. Basic Electronics -by B.L.Theraja (S.Chand and company)
5. Electrical and electronic measurements and instrumentation. A.K.Sawhney (Dhanpat Rai and sons)
6. A text book of electrical technology B.L.Thereja (S.Chand & Company Ltd.)
7. Micro Electronic Circuits (Fourth Edition) By Sedra and Smith (Oxford publication)
8. Modern digital electronics, R.P.Jain (McGraw-Hill) **ISBN:** 0073404578
9. Digital **And** Analogue Techniques**,** Navneet / Kale / Gokhale,Kitab Mahal.

PAPER-II

1 CPMS2 : Basic Digital Electronics

Unit I : Binary arithmetic & Logic gates : Binary,octal & Hexadecimal number system and their interconvertion**,** Binary arithmetic (addition, substraction,- using 1ös & 2ös compliment), multiplication & division. NOT, OR, AND, NAND, NOR gates (definition and truth table). EXNOR & EXOR gates, Half adder, full adder, Half subtractor, full subtractor & 7483 ICï 4 bit parallel adder. Binary codes : 8421,BCD,excess-3 & alphanumeric code.

Unit II : Boolean algebra & Logic families : Classification of logic families, characteristics (Fan-in, Fanout, Noise immunity, Propogation delay, Power dissipation), DTL, TTL, ECL & CMOS logic. Boolean laws, De-morgans theorem, Simplification of Boolean equations using boolean algebra Fundamental products & Kmap(K-map upto 4 variable).

Unit III : Flip Flops & Counters: Construction & working of Astable, monostable and Bistable transistorised multivibrators, RS, CLK RS, D, JK, JKMS Flip Flops (Logic diagram, Truth table, construction & working), Concept of edge trigger Flip-Flop, Concept of preset & clear terminal. Asynchronous & synchronous Counter , Up-down counters(up to 4-bits), modified asynchronous counter.

Unit IV : Shift registers : Types of shift registers, SISO, SIPO, PISO & PIPO shift registers (Construction & working), left shift-right shift registers, IC version of shift registerï 7495, Application of shift register. Ring counter, Johnsonös counter.

Unit V : A/D and D/A Converters : Parameters, Accuracy, Resolution, Need of A/D and D/A Converters, A/D Converters: Counting, Continuous, Successive Approximation Type. D/A Converters: Weighted resistors, R-2R ladder.

Books Recommended :

1. Modern digital electronics, R.P.Jain (McGraw-Hill) ISBN: 0073404578
2. Digital and Analogue Techniques, Navneet / Kale / Gokhale,Kitab Mahal.

Lab.-I

Practicals : Atleast 8 practicals based on Paper-I & II.

PAPER III
1 CPMS3 : Computer Organization

Unit-I : **Computer Basics :** Simple model of Computers, Characteristics of Computer, Problem solving, flow chart, program generation of computer, classification of computer.

Unit II : **Processor:** Structure of Instruction, Description of processor, CPU organization, Intel series of Microprocessor. Computer Architecture, Units, Processor to memory communication, I/O communications, Interrupts, Multiprogramming processor features, RISC, CISC.

Unit III : **Memory and I/O devices:** Main memory, Cache memory, Virtual memory, semiconductor memory, Memory controllers, Magnetic memory, Optical memory, Input units, output units, other units.

Unit IV: **Computer Software:** Introduction, System software, programming Languages, Translator, Application Software, 4GL, Firmware, Middle ware, Popular Software packages.

Unit V : **Operating systems:** Need of OS, Types of OS, Introduction to DOS, Internal and External commands of DOS, BIOS and DOS, Interrupts, Interrupt services, DOS interrupts and functional Calls, Introduction to WINDOWs, Desktop, Start menu, Status bar, Program manager, system setting menu, Accessories, system maintenance tools, Introduction to UNIX.

Books :

1. Introduction to Computer s: Srivastav
2. Understanding of Computers : rajgopalan.

Paper –IV
1CPMS4 : Microprocessor & Interfacing

Unit-I : Introduction to microprocessor, Explanation to terms, Evolution of microprocessor, Microcomputer programming languages, Practical application, Microcomputer architecture, Single chip microprocessors, CU, ALU, Memory, I/O, Characteristics of Interrupts I/O, DMA, Coprocessor.

Unit-II : Microcomputer S/W concepts, Instruction formats, Addressing modes, Instruction types, ALP, 8085 mpu : Register

structure, memory addressing. Interrupt system in 8085, Important features of 8086, 80486 and pentium.

Unit-III : Intel 86 : Introduction, Architecture, Register, Addressing modes, Data Xôfers, Arithmetics, Bit manipulation, String, Unconditional Xôfer, Conditional branch, Iteration control, Interrupt, Processor control, Assembler Dependent & Assembler pseudo instructions, I/O, IOP (8089), 86 Interrupts, 86 DMA.

Unit-IV : **Peripheral Interfacing :** Parallel vs Serial interfacing, Synch. & Asynch. data Sômission, USART, UART, keyboard /Display interfacing, cCassatte recorder I/P Concept, CRT interfacing & CRT Controller, Printing interfacing, Printer controller chip, DMA controller.

Unit-V : **Interfacing Standard :** Introduction, Parellel Interface, IEE488, GPI B, Typical interface std., CPIB system, GPIB operation, S-100 std. Bus, Serial interface, RS232C model, CRT interface, MODEM interface, RS422, RS 423.

Books Recommended :

1. Microprocessor Theory and Application (revised edition) - M.Raffiquellazammam
2. Microprocessor & interfacing : D.V.Hall.
3. Advanced Microprocessors and Peripherals :- Ray & Bhurchandi.
4. Intel Microprocessorôs (fourth edition) : Barry Brey.
5. Microprocessing System 8086/8088 :- Liu & Gibson.
6. IBM PC Assembly Language & Programming : Peter Abel.

Lab.-II

Practicals : Atleast 8 practicals based on Paper-III & IV

SYLLABUS PRESCRIBED FOR PG DIPLOMA IN COMPUTER MAINTENANCE
SEMESTER –II
PAPER-V
2CPMS1 : C LANGUAGE WITH ALP

Unit-I : **Introduction to C :** Introduction, Simple C program, character set, Keywords, Identifier, Variables, Data types operators, Expressions, Statements, Functions.

Unit-II : **Conditional statements, Loops & functions :** Relational operators, Logical operators, Conditional branching statements, conditional operators, Loops, Jumping functions, Anatomy of functions, Writing own functions, Function call.

Unit-III : **Arrays, Structures & Pointers :** Declaring & initialising arrays, Accessing array elements, Single dimensional array, 2-D arrays, Introduction to structures & Pointers.

Unit-IV : **Advance C :** Storage class specifiers : Auto, Register, Static, External, C preprocessor, Conditional compilation. Using assembly language in C : Clear Screen program for C, Compilation & Linking, Passing multiple parameters, summary on writing C procedures in assembly, Writing in-line assembly code in C, Summary on in-line assembly in C.

Unit-V : **C language with ALP using BIOS & DOS functions :** Procedures examples, Setting cursor, Clearing screen, Screen & K/B operation, Display on the screen, Display ASCII character set, Accepting input from K/B Display name.

Books Recommended :

1. Programming & problem solving through ñCò- Kanetkar.
2. ALP for PC : John Jocha, Peter Norton.
3. IBM PC ALP : Peter Abel "

PAPER-VI

2 CPMS2 : DATA COMMUNICATION, NETWORKING & INTERNET

Unit I : **Fundamentals of Data Communications:** Introduction, Communication Systems, Signal and data, Bit rate, Baud Rate, Digital Data, Analog Data, Simplex, Half Duplex and Full Duplex Modes of Transmission, Channel Characteristics, Transmission modes, Synchronous and Asynchronous Transmission, Modulation: Amplitude Modulation, Frequency Modulation, Phase Modulation.

Unit II : **Transmission Media :** Guided Media (Twisted pair, Co-axial cable, Optical fiber), Unguided Media (Radio, VHF, microwave, satellite), Infrared Transmission, Fibre Optics Communication : Components (Source, Channel Detector)

Unit III : **Data Modems:** Concept of Modulation, Pulse Code Modulation (PCM), Shift Keying [ASK, FSK, PSK, QPSK, DPSK], Encoding techniques and CODEC, Classification of Modems, Standards and Protocols, Protocols used by Modem to Transfer files, Establishing a Connection

Unit IV : **Data Communication H/W :** Network Architectures, Hosts, Clients, Circuit network configuration, Media. Communication devices, Digital transmission concept, Analog transmission concept, use of MODEM.Digital transmission of Analog data.

Unit V : **Multichannel Data Communication :** Circuits, channels and multichanneling, Multiplexing [FDM,TDM, CDM, WDM], Access Techniques (FDMA, TDMA, Spread Spectrum Techniques and CDMA), Digital hierarchies [SONET/SDH]

Books Recommended:

1. B. Forouzan, ñData Communication and Networkingò, First Edition, 1999, Tata McGraw Hill
2. W. Stallings, ñData and Communicationò, Sixth Edition, 2002, Prentice Hall of India
3. Data and Computer Communications, Eight Edition (2007), William Stallings
4. William A Shay, ñUnderstanding Data Communictions and Networksò, Second Edition, 1999, Brook Cole Publishing Company.

Lab.-III

Practicals : Atleast 8 practicals based on Paper-V & VI.

PAPER VII

2 CPMS3 : NETWORKING & INTERNET

Unit –I : **Networking Fundamentals :-** Telephone Communication, Voice Communication. Area Codes, Switches : Circuit switching, Digital switching, Network switching, PBX benefits, Cellular technology. FAX, ANI, IVR.

Unit II : **Network Topologies: -** Bus Topologies, Examples of bus topology: Ethernet, LocalTalk, Ring Topologies, Examples of Token Ring Topology: IBM Token Ring, FOOl (Fiber Distributed Data Interface), Star Topologies, Example of Star Network: ATM (Asynchronous Transmission Mode)

Unit III : **Network Architecture :** Layered architecture, OSI model, MAC, Protocols, Topology. Network component : Hubs, Switches, Routers, Gateways, Laget, Ethernet, FDDI, Servers, Server H/W, Network security.

Unit-IV : **Internet :** History, Growth, Owner, Anatomy, TCP/IP, IP address, Types of networks, LAN, WAN, C/S. Connectivity, www introduction, Servers, Browsers, http, IE, NN, Bookmarks, Cookies, E-mail, FTP.Telenet, Web publishing.

Unit-V : **Network Components :** Hub, Bridges, Routers, Switches, Gateways, VAST, Modems, E-Commerce, EDI-Electronic Data Interchange, ISDN:-Elements, Uses of ISDN, Broadband ISDN, Network Security, firewall, VPN

Books Recommended :

1. Internet & Web Design - MacMillan.
2. Computer Networking - Ross
3. Business Data Communication & Networking (fifth edition) ï Fitzerland & Dennis.
4. Data Communications and Networking, Fourth Edition (2006), Behrouz A. Forouzan, Tata McGraw-Hill
5. A.S. Tanenbaum, ñComputer Networksò, Fourth Edition, 2002, Pearson Education
6. A Leon-Gracia and I Widjaja, ñCommunication Networks, First Edition, 2000, Tata McGraw Hill

PAPER-VIII

2 CPMS4 : PC MAINTENANCE & TROUBLE SHOOTING

Unit-I : **Microcomputer System & Peripherals :** Computer Organization, Character & numbers, Codes, Memory, ALU. CU, IF, Interrupts, I/O, Device controllers, Error detection, MP, PC, K/B, CRT, Printer, Magnetic storage. Devices (FD, HD, MTD, OD), Special peripheral.

Unit-II : **IBM PC H/W overview :** Introduction (BIOX, DOS), PC family & H/W, Systemôs box, M/B, I/O & Interrupts, DMA, Peripherals interface & Controller, K/B interface, Parallel & Serial interface, CRT controller, FDC, HDC, Memory Refresh, POST.

Unit-III : **Motherboard :** Dump & Smart chips, Role of 8284, 8288, 8259, & 8253, PPI 8255, Function of 8237, Functional units of M/B & its inter communication, Working of FDC, HDC, Display & K/B controller.

Unit-IV : **PC installation & Preventive Maintenance :** Introduction, Planning, Practice, Routine checks configuration, Upgradation, Maintenance, System usages.

Unit-V : **Trouble Shooting :** Introduction, Computer faults, Nature & Types, Diagnostics, Fault elimination process, Systematic trouble shooting, Diagnosis & Rectification of FDC, HDC, Monitor M/B, K/B, Printer.

Books Recommended :

1. IBM PC & Clones - Govindrajalu.
2. IBM PC Trouble shooting & Maintenance - Brenner.
3. ABC of IBM PC - Peter Norton.

Lab.-IV

Practicals : Atleast 8 practicals based on Paper-VII & VIII.

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