SCHEME OF INSTRUCTION & EXAMINATION

B.E. IV YEAR

(BIO-MEDICAL ENGINEERING)

B.E. IV/IV (SEMESTER II)

S.NO.	SYLLABUS / REF. NO.	SUBJECT	SCHEME OF INSTRUCTION		SCHEME OF EXAMINATION			CREDITS
			PERIODS PER WEEK		DURATION IN HOURS	MAXIMUM MARKS		
		THEORY	L/T	D/P		UNIV. EXAM	SESSIONALS	
1.	BM451 UE	MEDICAL DEVICE DESIGN	4	-	3	75	25	4
2.		ELECTIVE III	4	-	3	75	25	4
3.		ELECTIVE IV	4	-	3	75	25	4
PRACTICAL								
1.	BM 482 UE	SEMINAR	-	3	-	-	25	2
2.	BM 483 UE	PROJECT	-	6	VIVA VOCE	GRADE*	50	12
TOTAL			**12**	**12**		**275**	**175**	**28**

ELECTIVE III

BM	452UE	Biometric System
BM	455UE	Biomems and Nanobiomedicine
EC	455UE	Embedded System Design
EE	451UE	Relaibility Engineering
ME	455UE	Composite Materials

ELECTIVE IV

BM	453UE	Physiological Systems Modeling
BM	454UE	Bioelectricity
CS	463UE	Data Mining
ME	460UE	Robotics
LA	454UE	Intellectual Property Rights

SCHEME OF INSTRUCTION & EXAMINATION

B.E. IV YEAR

(BIO-MEDICAL ENGINEERING)

SERVICE COURSES OFFERED TO OTHER DEPARTMENTS

Semester-II

S.No.	Syllabus / Ref. No.	SUBJECT	Scheme of Instruction		Scheme of Examination		
			Periods per week		Duration in Hours	Maximum Marks	
Elective – III		**THEORY**	L/T	D/P		Univ. Exam	Sessionals
1	BM 454UE	Bioelectricity	4	-	3	75	25
2	BM406UE	Rehabilitation Engineering					
TOTAL			**4**	**-**	**3**	**75**	**25**
Elective – IV							
1	BM403 UE (CSE/ECE/EEE)	Medical Image Processing	4	-	**3**	**75**	**25**

BM 451 UE **MEDICAL DEVICE DESIGN**

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks

UNIT-I

Medical devices. Overview of product .Product definition process. Quality function deployment process. Materials-Biocompatibility, International regulatory efforts. Device category and choice of test programs. Biological control tests. Test for biological evaluation.

UNIT-II

Specifying and designing the product. Engineering requirements-design specification, risk management, Hardware design-component selection, design of experiments, software design- object oriented design, software coding.

UNIT-III

Testing and data analysis. Basis and types of testing, hardware verification and validation-standard tests , software verification and validation, reliability evaluation, analysis of test results-failure rate, Mean Time Between Failures (MTBF).

UNIT-IV

Medical device regulations and standards. Food and Drug Administration, Medical device directives, ISO 9001 series of standards, Domestic standards, International standards.

UNIT-V

Quality and Compliance. intellectual property-patents, human factors, V-modal, Computer System validation, CFR part-11 and other applications.

Suggested Reading:

1. Richard C.Fries, *Reliable design of medical devices*, Marcel Dekker Inc., 1997.
2. Richard C.Fries, *Handbook of medical device design*, Marcel Dekker Inc., 2001.

BM 455 UE

BIOMEMS AND NANOBIOMEDICINE

Instruction:	4 Periods per week
Duration of University Examination:	3 Hours
University Examination	75 Marks
Sessional:	25 Marks
Credits	4

OBJECTIVES:

1. Provide general design techniques for miniaturized biomedical sensors, actuators and bioMEMS using simulation, materials science, semiconductor systems, optoelectronics, microelectronics circuits, electrochemical solid state devices, and transducer platforms.
2. Analyze design concepts of interface silicon/cell systems and integrated bioMEMS devices based on lab-on-a-chip concepts for DNA analysis, bacteria detection, cell research, cell statistics, drug delivery, biomedical sensors and actuators.
3. Develop multi-disciplinary research skills on system and fabrication design of innovative lab-on-a-chip integrated biomedical devices involving technical, feasibility, device performance, cost, and market need analysis.

UNIT I

Introduction to MEMS: MEMS and Microsystems and microelectronics. Microsystems and miniaturization. Applications of Microsystems. Materials for MEMS and Microsystems, Packaging materials and smart materials

UNIT II

Nanoscience and nanotechnology. Nanoscience and nanotechnology in biology and medicine: An Overview, Nanomaterials, quantum well, wire, dot, carbon nanotubes

UNIT III

Microsystem Fabrication Process –Photo Lithography, Ion implantation, diffusion, oxidation, CVD, PVD, Eching. Bulk Micro manufacturing, surface micromachining, LIGA Process
Nanomaterials Fabrication: Bottom-up vs. top-down, Epitaxial growth ,Self-assembly.

UNIT IV

Nanomedicine: Drug delivery to cells using nanotubes and nanowires,Quantum Dots for drug discovery and imaging,Quantum Dots and gold nanoparticles for cancer treatment,Nanoparticle mediated gene therapy,Growth of neurons on Nanomaterials,Nanomaterials for brain protection and repair,Nanorobotics for surgery

UNIT V

Nanobiosensors: Nanosensor probes for single living cells,Silicon nanowires for monitoring drug interaction,Carbon nanotubes for monitoring Antibody-Antigen Reaction, DNA switch,DNA biochips,Cantilever nanosensors for identifying genetic sequences Nanotoxicology

Reference Books:

1. Mems and Microsystem, Design and Manufacture,Tai – Ran Hsu, Tata Mcgraw Hill, 2002.
2. Nanomedicine Design of Particles, Sensors,Motors, Implants, Robots, and Devices. Mark J. SchulzVesselin N. Shanov ,Yeoheung Yun, Arctech House, 2009.
3. Handbook of Chemical and Biological Sensors, Richard F Taylor, Arthur D *Little Inc* Jerome S Schultz ,*University of Pittsburgh* Institute, British Library, 1996.
4. Biomedical Nanotechnology, Neelina H. Malsch, CRC Press, 2005.

EC 455 UE

EMBEDDED SYSTEM DESIGN

Instruction:	4 Periods per week
Duration of University Examination:	3 Hours
University Examination	75 Marks
Sessional:	25 Marks
Credits	4

OBJECTIVES:

a. Aspects of the design and development of an embedded system, including hardware and embedded software development.

UNIT I

Introduction to 8051 and operating modes – addressing modes – instruction set – on chip memories – on chip timers& counters, serial ports – interrupt control.

UNIT II

(Preliminary treatment with 8051microcontroller) ISA bus protocol – input-output addressing – direct memory access – arbitrations: priority arbitration. Daisy chain arbitration, network oriented arbitration.

UNIT III

Introduction to MC 68 HC 11 operating modes – programmers model – addressing modes – instruction set – on chip memories – on chip I/O ports, ND converters. Timer System.

UNIT IV

(Preliminary treatment with MC 68 HC 11 series microcontroller) Timing generation ad measurement periodic interrupts, generating square waves.

Measurement of period and pulse width – serial communication interface, serial peripheral interface – low level device drivers. Serial protocols – parallel protocols wireless protocols.

UNIT V

Debugging – simulators – emulators –EPROM emulators – software development cycle- programming using assembly language and C.

Suggested Reading:

1. Mohammed Ali Mazidi, Janice Gillespie Mazidi, The 8051 Microcontroller and Embedded System, Pearson Education Asia, 2000.
2. MC 68 HC 11 X series Reference manual, Motorola, 1995.
3. Frank vahid, Tony givargis, Embedded System Design – A Unified Hardware/Software Introduction, John Wiley & sons inc. 2002.
4. Jonathan W Valvano, Embedded Microcomputer System, Brooks/Cole Thomas learning, 2000.

EE 451 UE

RELAIBILITY ENGINEERING

Instruction:	4 Periods per week
Duration of University Examination:	3 Hours
University Examination	75 Marks
Sessional:	25 Marks
Credits	4

OBJECTIVES:

a. New tools in reliability engineering principles

b. How operations can improve reliability of their processes

c. How someone can calculate the cost of unreliability for making business decisions to attack problems of unreliability.

d. Find out reliability tools helpful for providing supporting evidence during root cause analysis failure investigations

e. Find reliability tools and techniques helpful for understanding failure data

UNIT I

Discrete and continuous random variables. Probability density function and cumulative distribution function. Mean an variance. Binominal, Poisson, exponential and Weibull distributions.

UNIT II

Failure and causes of failure. Failure rate and Failure density. Reliability function MTTF.
Bath tub curve for different systems. Parametric methods or above distributions. Nonparametric methods from filed data.

UNIT III

Reliability block diagram. series and parallel system .Net work reduction technique, examples. evaluation of failure rate, MTITE and reliability, active and stand by redundancy , r out of n configuration. Non-series- parallel systems. Path based and cut set methods.

UNIT IV

Availability, MTFR and NTBF Markov models and state transition matrices. Reliability modes for single component, two component. Load sharing and standby systems. Reliability and Availability models of two unit parallel system with repair and standby system with repair.

UNIT V

Repairable systems, maintainability, preventive maintenance. Evaluation of reliability and MTTF. Overhauling and replacement. Optimum maintenance policy. Markov model of a power plant with identical units and non-identical unit. Capacity outage probability able. Frequency of failures and cumulative frequency.

Suggested Reading:

1. Charles E. Ebeling, Reliability and Maintainability Engineering, Tata Mcgraw Hill, International edition, 1997.
2. Balaguruswamy, Reliability Engineering, Tata Mcgraw Hill publishing company, 1984.
3. SR.N.Allan, Reliability Evalution of Engineering systems, Pitman, publishing, 1996.
4. Endrenyi, Reliability modeling in Electric Power System, John Wiley &sons, 1978.

ME 455 UE

COMPOSITE MATERIALS

Instruction:	4 Periods per week
Duration of University Examination:	3 Hours
University Examination	75 Marks
Sessional:	25 Marks
Credits	4

OBJECTIVES:

a. Provide training in the analysis, response/behavior, design, selection, repair and recycling of anisotropic and/or composite materials - including societal and fiscal considerations.

UNIT I

Introdution: Fibres, matrix materials, interfaces, polymer matrix composites, metal matrix composites, ceramic matrix composites, carbon fibre composites.

UNIT II

Micromechanics of composites:

Mechanical properties production of elastic constant, micromechanical approach, Halpin- Tsal equations, transverse stresses.

Thermal properties: Hygrothermal stresses, mechanics of load transfer from matrix to fibre.

UNIT III

Micromechanics of composites:

Elastic constants of a lamina, relation between engineering constants and reduced stiffness and compliance, variation of lamina properties with orientation, analysis of laminated composites, stresses and strains with orientation.

UNIT IV

Inter- laminar stresses and edge effects. Simplified composite beam solutions. Bending of laminated beams. Tensile and compressive strength of unidirectional fibre composites, fracture mode in composite: single and multiple fracture, de-bonding , fibre pullout and de-lamination failure, fatigue of laminate composite. Effect of variability of fibre strength.

UNIT V

Strength of an orthotropic lamina: maximum stress theory , maximum strain criteria, maximum work (Tsai-Hill) criterion, quadratic interaction criteria. Designing with composite materials.

Measurement of constituent material properties: fibre tests, matrix tests.

Measurement of basics composite properties: tensile test, compressive test, a plane shear test, interlaminar shear test, flexure test.

Suggested Reading:

1. Jones, R.M., Mechanical of Composite Materials, McGraw hill co., 1967.
2. Ronald F.Gibson, Principles of Composite Materials Mechanics, McGraw-Hill, inc.,1994.
3. Krishn, K. Chewla, Composite Materials, Springer Verlag,1987.
4. Carl.T.Herakovich, Mechanics of Fibrous Composites, John Wiley Sons inc., 1998.

BM 453 UE

PHYSIOLOGICAL SYSTEMS MODELING

Instruction:	4 Periods per week
Duration of University Examination:	3 Hours
University Examination	75 Marks
Sessional:	25 Marks
Credits	4

OBJECTIVES:

a. To appreciate the value and application of physiological models
b. To understand the process of modeling dynamically varying physiological systems
c. To understand methods and techniques to analyze and synthesize dynamic models
d. To develop differential equations to describe the dynamic behavior of physiological systems
e. To simulate and visualize dynamic responses of physiological models using computers
f. To solve and implement a modeling and design problem from inception to completion

UNIT I

Modeling concepts: The techniques of mathematical modeling. Classification of models characteristics of models. Metabolic and Endocrine Systems: Chemical reactions.
Transport process. Diffusion. Transport by circulation. Controlled process.

UNIT II

Approaches to modeling: Mathematical representation of compartment and control system models. Perturbation schemes. Steady state. Dynamic equilibrium. Convolution approach.
Biological receptors: Receptor characteristics ,adaptation, rate sensitivity.

UNIT III

Glucose- insulin model to estimate insulin sensitivity. Insulin sensitivity; development of models of optimal complexity. Model decomposition. Models of glucose utilization. Model comparison. Insulin sensitivity index.

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UNIT IV

Statistical approach modeling: Introduction . Discrete statistical signals. Continuous statistical signals. Averaging computations.

UNIT V

Tracer dynamics: Organ compartment model to relate Organ volume and flow-rate to monitored trace concentration, administration and its time profile. Model for measuring carbohydrate metabolism from monitoring of intravenously injected glucose.

Suggested Reading:

1. Kapoor J.N., Mathematical modeling, Wiley Eastern Lt ., 1988.
2. Carson E.R., Cobelli C. and Finkelstein L., The Mathematical Modeling of Metabolic and Endocrine Systems, John Willey and sons,1983.
3. William Simon, Mathematical techniques for Biology and Medicine, Dover Pub.1986.

BM 454 UE

BIOELECTRICITY

Instruction:	4 Periods per week
Duration of University Examination:	3 Hours
University Examination	75 Marks
Sessional:	25 Marks
Credits	4

OBJECTIVES:

a. Electrical properties of the cell membrane
b. Action potentials
c. Extra cellular waveforms
d. Cardiac electrophysiology
e. Function stimulation (FES)

UNIT I

Basic Electromagnetic theory: Scalar and Vector quantities. Gradient, Divergence, Laplacian Operators. Vector Identities, Guass theorem, Green`s theorem, Electrical sources and fields, Fundamental Relationships, Poisson`s Equation, Concept of monopole and dipole filed.

UNIT II

Action potentials and propagation: Membrane structure, Nernst Potential and Resting Potential Action Potential- Origin and Characteristics. Application of Nernst equation in bio fluids. Voltage clamp. Hodgkin-Huxley equations analysis. Core conductor model, Propagation in myelinated and unmyelinated nerve fibres.

UNIT III

Electrophysiology of skeletal muscle and neuromuscular junction: Release of Neuromuscular transmitter, post junctional response to transmitter. Origin of EPSP and IPSP. Neuro-muscular block, determination of degree of neuro-muscular block. Muscle structure and contraction. Excitation contraction mechanism.

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UNIT IV

Electro-physiology of Heart: Properties of Cardiac muscle, Heart vector, electrical activity of the heart. Standard leads, lead vectors. Recording of the ECG from the surface. Dipole theory of the heart. Relationship between the different ECG leads.

UNIT V

Application of Bio-Electric Phenomena:
Functional Neuro-muscular stimulation, impedance plethysmography, measurement of resistance of isotropic & anisotropic tissue and Electro encephalography.

Suggested Reading:

1. Plonsey Robert and Roger C., Barr R., Bioelectricity, Plenum Press, 1988.
2. Plonsey Robert and Flemng David G., Bioelectricity Penomena, McGraw Hill, 1969.
3. D.P.Zipes and J.Jalife, Cardiac Elecro-physiology : From Cell to Bedside, Saunders, Philadelphia, 1990.

CS 463 UE

DATA MINING

Instruction:	4 Periods per week
Duration of University Examination:	3 Hours
University Examination	75 Marks
Sessional:	25 Marks
Credits	4

OBJECTIVES:

a. To introduce students to the basic concepts and techniques of Data Mining.
b. To develop skills of using recent data mining software for solving practical problems.
c. To gain experience of doing independent study and research.

UNIT I

Data Warehousing: Introduction, What is a DWH. Definition, Multidimensional data model, OLAP operations, Warehouse schema, DWH architecture, Warehouse server, Metadata OLAP engine, DWH Backend process.

Data Mining: Introduction, What is DM, Definitions, KDS vs DM, DBMS vs DM, DM techniques, Other Mining Problems Issues and challenges in DM, DM application areas, DM applications- Case Studies.

UNIT II

Association Rules : Introduction, What is AR, Methods to discover ARs. A Priori algorithm, Partition algorithm, Pincer- Search algorithm, Dynamic-Itemset counting algorithm, FP-Tree Growth algorithm, Discussion on different algorithms, Incremental algorithm, Border algorithm, Generalized AR, ARs with item constraints.

UNIT III

Clustering Techniques : : Introduction , Clustering Paradigms, Partitioning algorithm, K-Medoid algorithm, CLARA, ALARANS, Hierarchical Clustering , DBSCAN ,BIRCH, CURE, Categorical Clustering algorithms, STIRR, ROCK, CACTUS

Other Techniques: Introduction, What is a NN, Learning in NN, unsupervised Learning , data Mining using NN : A case study, genetic algorithm, Rough sets, support vector machines.

UNIT IV

Decision Trees: Introduction, What is a DT, Tree construction principle, Best Split, Splitting Indices, Splitting Criteria, DT construction algorithm, CART, ID3, C4.5, CHAID, DT construction with presorting , Rain Forest, Approximate Methods, CLOUDS, BOAT, Pruning Technique, Integration of Pruning and construction An ideal algorithm.

UNIT V

Web Mining : Introduction, Web Mining, Web content Mining, Web structure Mining, Web Usage Mining, Text Mining, Unstructured Text, Episode Rule Discovery for Texts, Hierarchy of categories, Text Clustering.

Temporal & Spatial data mining : Introduction, What is a TDM, Temporal association rules, sequence mining, The GSP algorithm, SPADE, SPIRT, WUM, Episode discovery, event prediction problem, time – series analysis, spatial Mining, SM tasks, Spatial Clustering Spatial Trends.

Suggested Reading:

1 Arun K Pujari, Data Mining Technique, University Press, 2001.
2 Jiawei Han , Michelie Kamber, Data Mining: Concepts and Techniques, Morgarn Kaufmann Publishers, 2006.
3 Rajeev Paride, Principles and Implementation of Data Warehousing, Firewall Media , 2006
4 Sivanandam, . Data Mining : Concepts and Techniques & Implementation, Thomson Learning, 2006.

ME 460 UE

ROBOTICS

Instruction:	4 Periods per week
Duration of University Examination:	3 Hours
University Examination	75 Marks
Sessional:	25 Marks
Credits	4

OBJECTIVES:

a. The goal of the course is to familiarize the students with the concepts and techniques in robot manipulator control, enough to evaluate, chose, and incorporate robots in engineering systems.

UNIT I

Introduction to Robotics Basic structure of Robots. Degree of freedom of Robots. Work envelope. Classification of Robots based on drive technology, Work- envelope and motion control, methods. Application of Robots in industry. Specification of requirements of motion and force for different application. Repeatability, Precision and Accuracy as applied to Robots.

UNIT II

Rotation matrix. Homogeneous transformation matrix. Denavit and Hartenberg representation. Euler anglers and RPY representation. Representation of absolute position and orientation in terms parameters, Kinematics equation for manipulators. Inverse kinematics of Robot arm for position and orientation. Redundancy in Robots.

UNIT III

Jacobian for direct and inverse kinematics. Trajectory planning for robots. Trajectory control based on incremental inverse kinematics of kinematics of equations, Static force analysis, stiffness.

UNIT IV

Newton – Euler formulation of dynamic equation. Lagrange formulation. Inertia tenser. Control schemes, individual joint control and disadvantages. Control through computed torques.

UNIT V

Position and Velocity measurement. Optical encoders. Different types of End effectors for industrial Robots. Range and Proximity sensing. Tactile sensors. Force and Torque sensors. Drives used in industrial Robots. Introduction to techniques used in Robot vision. Image acquisition and processing. Introduction to Robot programming.

Suggested Reading:

1. Fu. K.S., Gonzalez R.C., Lee C.S.G. Robotics, Control- Sensing Vision and Intelligence, McGraw Hill, Int. Ed., 1987.
2. Asada and Slotine , Robot Analysis and Intelligence, Willey- Inter- Science, 1986.
3. Spong and Vidyasagar, Robot Dynamic & Control, John Wiley and Sons, Ed., 1990.
4. Grover M P, Industrial Robotics, McGraw Hill Publication, 1999.
5. Mittal and Nagrath, Industrial Robotics, Tata McGraw Hill Publication, 2004.

LA 454 UE

INTELLECTUAL PROPERTY RIGHTS

Instruction:	4 Periods per week
Duration of University Examination:	3 Hours
University Examination	75 Marks
Sessional:	25 Marks
Credits	4

OBJECTIVES:

a. To provide an understanding of basic concepts of IP relating to technology
b. To give an insight into IP Management, Licensing, Valuation, Audit and other aspects of IP.
c. To teach basic skills necessary for a good IP hygiene within the company.

UNIT I

Meaning of intellectual property Rights. Justification of intellectual property Rights. Classification of thee rights. Classification of Treaties relating to intellectual property Rights- (i) Stranded setting treaties (ii) Global protection system treaties. (iii)Classification treats.

The salient features of the TRIPS Agreement. The two international institutions – (i) The world intellectual property organization (ii) the world trade organization.

UNIT II

History of the patent system. Patents in all fields of technology.

i. Patent on genetic resources patents on chemicals, designs, patent based on software, business methods, internet patent, etc.
ii. Exception to exclusive rights conferred to a patent holder.
iii. Ground for revocation f patent.
iv. Remember for infringement of a patent.

UNIT III

Copyrights and related rights. Nature and scope of protection of copyrights and related rights. Protection of copyrights in the digital media. Defense of fair use. Moral rights of the author. Copyrights societies. Remedies for infringement of Copyrights.

UNIT IV

Nature and scope of protection of design rights, protection of layout designs (topographies) of integrated circuits , protection of undisclosed information, protection of trade marks, domain names and geographical indications.

UNIT V

Practical aspects – drafting of a patent. Some exercises on the preliminary rules on preparing an application seeking a patent.

Suggested Reading:

1. Cornish W.R., Intellectual property: patents, copyright, trademarks and allied rights, sweet and Maxwell 1993.
2. P. Narayana, Intellectual property law, eastern law house 2nd ed., 1997.
3. Robin Jacob and Daniel Alexander, a guide book to Intellectual property patent trademarks, Copy rights and design, sweet and Maxwell 4th ed., 1993.

BM 482 UE

SEMINAR

Instruction:	3Periods per week
Sessional:	25 Marks
Credits	2

Oral presentation is an important aspect of engineering education. The objective of the seminar course is to motivate a student to do a systematic and independent study of state-of-art topics in a broad area of his/her interest.

Seminar topics may be chosen by the student with the suggestions from the faculty members. Students are to be exposed to following aspects a of seminar presentation.

Students are to be exposed to following aspects of seminar presentations.

Literature survey
Organization of material to be presented
Preparation of OHP/Slides/PC Presentation
Technical writing.

Each student is required to

1. Submit one page synopsis of the seminar talk for display on notice board of the department.
2. Give a 20 minutes presentation with the aids of an OHP/PC/Slide projector, followed by a 10 minutes discussion.
3. Submit the report is on the seminar topic presented along with list of reference and slides/ transparencies used.

Seminars are to be scheduled from the 3rd week to the last week of the semester and any change in schedule should be discouraged.

Sessional marks will be awarded jointly or independently by at least two faculty members. The awards e on the basis if the oral presentation made, written materials submitted, active participation of the student in the proceeding as well as involvements in the discussions.

BM 483 UE

PROJECT

Instruction:	6 Periods per week
Duration of University Examination:	Viva voce
University Examination	Grade
Sessional:	50 Marks
Credits	12

'Solving a real life problem' should be the focus of U.G. project. Faculty members should propose the project briefs (scope and references) well in advance, which should be made available to the students at the department library. The project could be classified as hardware, software, modeling, and stimulation. It should involve one or many elements of techniques such as analysis, design and synthesis.

The department will appoint a project coordinator who will coordinate the following:

Grouping of students (max. 3 in a group)
Allotment of projects and projects guides
Project monitoring at regular intervals

All projects allotment is to be completed by the 2nd week of 4th year 1st semester, so that students get sufficient time for completion of the project.

All projects will be monitored at least twice in a semester through students' presentation. Sessional marks are to e based on the Grades/Marks, awarded by a monitoring committee comprising of faculty members as well as by the supervisor.

Efforts should be made that some of the projects are carried out in industries with the help of industry coordinators. Problems can also be invited from the industries to be worked out through U.G. projects. Common norms will be established for final documentation of the project report by the respective departments.

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* Excellent /Very Good / Good / Satisfactory / Unsatisfactory

Note: Three periods will be assigned to each project guide irrespective of the number of projects guided.