VII SEMESTER

Mechatronics and Applications		Semester	VII
Course Code	**BIP701**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:2:2:0	SEE Marks	50
Total Hours of Pedagogy	40 hours Theory + 8-10 Lab slots	Total Marks	100
Credits	04	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives:

- To acquire a strong foundation in science and focus in mechanical, electronics, control, software, and computer engineering, and a solid command of the newest technologies.
- To understand the evolution and development of Mechatronics as a discipline.
- To substantiate the need for interdisciplinary study in technology education
- Understand the applications of microprocessors in various systems and to know the functions of each element.
- To demonstrate the integration philosophy in view of Mechatronics technology
- To be able to work efficiently in multidisciplinary teams.

Teaching-Learning Process (General Instructions)

These are sample Strategies; that teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Encourage collaborative Learning (Group Learning) in the class.
3. Ask HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking.
4. Individual teachers can device innovative pedagogy to improve teaching-learning.

MODULE-1

INTRODUCTION: Definition of Mechatronics, Multi-disciplinary scenario, Evaluation of Mechatronics, Objectives, Advantages & Disadvantages of Mechatronics, An Overview of Mechatronics, Microprocessor Based Controllers, Principle of Working of Automatic Camera, Automatic Washing Machine & Engine Management System.

MODULE-2

REVIEW OF SENSORS AND TRANSDUCERS: Definition and Classification of Transducers, Definition & Classification of Sensors, Working Principle and Application of Displacement, Position & Proximity, Velocity and Motion, Force, Fluid pressure, Liquid flow, Liquid level, Temperature, Light sensors, Selection of transducers.

MODULE-3

DIGITAL PRINCIPLES: Introduction, Digital Number System, Range and Weight of Binary Number System, Octal and Hexadecimal Number Systems, Conversion, BCD Number Systems, Gray Code, Boolean Algebra, Logic gates, Logic Functions, More Logic Gates, Universal Gates, Exclusive-OR Gate, Combinational and Sequential Logic Circuits, Flip- Flops.

MODULE-4

MICROPROCESSOR: Intel 8085, ALU, Timing and Control Unit, Registers, Data and Address Bus, Pin Configuration, Intel 8085 Instructions, Op code and Operands, Timing Diagram.

PROGRAMMING OF MICROPROCESSOR: Programming the 8085, Assembly language programming.

MODULE-5
MICRO CONTROLLER: Introduction to microcontrollers, Intel 8051 Microcontroller Architecture and Pin diagram, Selection and Application of Microcontroller. **PLC:** Programmable Logic Controllers, Basic Structure, Input/Output Processing, Programming, Mnemonics, Timers, Internal Relays and Counters, Shift Registers, Master and Jump controls, Data handling, Analogue input/output, Selection of a PLC.

PRACTICAL COMPONENT OF IPCC

Sl.NO	Experiments
1	To write a assembly language program for adding 2 bit (8) numbers by using-8085 micro-processor kit.
2	To write a assembly language program for subtracting 2 bit (8) numbers by using-8085 micro-processor kit.
3	To write a assembly language program to add two 8 bit decimal numbersby using-8085 micro-processor kit.
4	To write a assembly language program to find the 2's compliment of an 8 bit decimal numbers by using-8085 micro-processor kit.
5	To write a assembly language program to find the larger of the two numbers by using-8085 microprocessor kit
6	To write a assembly language program to arrange 3 numbers in descending order by using-8085 microprocessor kit.
Demonstration Only	
7	Stepper Motor Control
8	Speed Control of AC Motor
9	Speed Control of DC Motor

Course outcomes (Course Skill Set):

At the end of the course, the student will be able to:

1. Illustrate various components of Mechatronics systems.
2. Assess various control systems used in automation.
3. Develop mechanical, hydraulic, pneumatic and electrical control systems.
4. Design and conduct experiments to evaluate the performance of a Mechatronics system or component with respect to specifications, as well as to analyze and interpret data.
5. Function effectively as members of multidisciplinary teams.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CIE for the theory component of the IPCC (maximum marks 50)

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**.
- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.
- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks)**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

CIE for the practical component of the IPCC

- **15 marks** for the conduction of the experiment and preparation of laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.
- On completion of every experiment/program in the laboratory, the students shall be evaluated including viva-voce and marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to **15 marks**.
- The laboratory test **(duration 02/03 hours)** after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks.**
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scoredby the student shall be proportionally scaled down to 50 Marks

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.

Suggested Learning Resources:

Books

1. Mechatronics - W. Bolton – Pearson Education Asia - 2nd Edition, 2001.
2. Fundamentals of Microprocessor and Micro Computer - B. Ram - Dhanpat Rai and Sons - 4th Revised Edition.
3. Mechatronics Principles, Concepts and Application - Nitaigour and Premchand, Mahilik – Tata McGraw Hill - 2003.
4. Mechatronics by HMT - TMH.

Web links and Video Lectures (e-Resources):

- http://engineering.nyu.edu/gk12/amps-cbri/pdf/Intro%20to%20Mechatronics.pdf
- http://ggn.dronacharya.info/EEEDept/Downloads/QuestionBank/VIISem/AI/SectionB/sectionB.pdf
- https://www.iitmanagement.com/images/Gallery/DIP-EE-4TH%20SEM%20-%20DE.pdf
- https://www.youtube.com/watch?v=I78iyzXQrP4
- https://www.tutorialspoint.com/microprocessor/microcontrollers_8051_architecture.htm#:~:text=8051%20microcontroller%20is%20designed%20by,addressable%20as%20per%20the%20requiremen .
- https://www.youtube.com/watch?v=PbAGl_mv5XI
- https://www.youtube.com/watch?v=LHn7O6PUaoY

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

At the end of the lecture/presentation, numerical exercises are to be taken up to solve problems related to the topics covered. Additional problems are to be given for practice and also as assignments under each of the topics covered.

Database Management Systems		Semester	VII
Course Code	**BIP702**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:2:2:0	SEE Marks	50
Total Hours of Pedagogy	40 hours Theory + 8-10 Lab slots	Total Marks	100
Credits	04	Exam Hours	03
Examination nature (SEE)	Theory		

Course objectives:

1. Understand relational data model in terms of data structure, data integrity, and data manipulation.
2. Understand and create conceptual database models utilizing entity-relationship.
3. Design data structures that will limit redundancy and enforce data integrity while conforming to organizational requirements utilizing normalization methodology.
4. Understand the theory behind the relational data model as it applies to interactions with current database management systems.
5. Interpret a given data model to query the database and transform the data into information using SQL

Teaching-Learning Process (General Instructions)

These are sample Strategies; that teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Encourage collaborative Learning (Group Learning) in the class.
3. Ask HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking.
4. Individual teachers can device innovative pedagogy to improve teaching-learning.

MODULE-1

DATABASES AND DATABASE USERS: Introduction, characteristics of data base approach, intended uses of a DBMS, advantages and implication of database approach.

DATABASE SYSTEMS CONCEPTS AND ARCHITECTURE: Datamodels, Schemas and instances, DBMS architecture and data independence, database language and interfaces, database system environment, classification of data base management systems.

MODULE-2

DATA MODELING: High level conceptual data models for database design. Entity types, entity sets, attributes, and keys Relationships, relationship types, roles and structural constraints. Weak entity types. ER diagrams.

RECORD STORAGE AND PRIMARY FILE ORGANIZATION:

Secondary storage devices, buffering of blocks, placing file records on disk, operations on files, heap files and sorted files, hashing techniques.

MODULE-3

INDEX STRUCTURE OF FILES: Single-level and multilevel ordered indexes, dynamic multi level indices using B-trees and B+ trees.

MODULE-4

RELATIONAL DATA MODEL AND RELATIONAL ALGEBRA: Brief discussion on Codd rules, relational model concepts, constraints and schemas. Update operation on relations.

Structured Query Language (SQL): Data definition in SQL2.Basic and complex queries in SQL.

MODULE-5

Transaction management and Concurrency control:

Transaction management: ACID properties, serializability and concurrency control, Lock based concurrency control (2PL, Deadlocks), Time stamping methods, optimistic methods, database recovery management.

PRACTICAL COMPONENT OF IPCC

Sl.NO	Experiments
1	Data definition languages (ddl), Data manipulation language (dml) commands of base tables and views
2	High level programming language extensions
3	Front end tools
4	Forms-triggers-menu design.
5	Design and implementation of employee
6	An exercise using Open-Source Software like MySQL

Course outcomes (Course Skill Set):

At the end of the course, the student will be able to:

1. Illustrate various components of Mechatronics systems.
2. Assess various control systems used in automation.
3. Develop mechanical, hydraulic, pneumatic and electrical control systems.
4. Design and conduct experiments to evaluate the performance of a Mechatronics system or component with respect to specifications, as well as to analyze and interpret data.
5. Function effectively as members of multidisciplinary teams.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CIE for the theory component of the IPCC (maximum marks 50)

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**.
- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.
- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks)**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

CIE for the practical component of the IPCC

- **15 marks** for the conduction of the experiment and preparation of laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.
- On completion of every experiment/program in the laboratory, the students shall be evaluated including viva-voce and marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to **15 marks**.

- The laboratory test **(duration 02/03 hours)** after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks.**
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scoredby the student shall be proportionally scaled down to 50 Marks

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.

Suggested Learning Resources:

Books

1. Connolly, T. and C. Begg, "Database Systems: A Practical Approach to Design, Implementation, and Management," 6th edition, Pearson, 2014
2. Coronel, C. and S. Morris, "Database Systems: Design, Implementation, & Management," 12th edition, Cengage, 2016

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

At the end of the lecture/presentation, numerical exercises are to be taken up to solve problems related to the topics covered. Additional problems are to be given for practice and also as assignments under each of the topics covered.

Quality Assurance and Reliability		Semester	**VII**
Course Code	**BIP703**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40 hours	Total Marks	100
Credits	04	Exam Hours	03
Examination nature (SEE)	**Theory**		

Course objectives:

- To understand the fundamentals of Quality tools and techniques
- To apply the quality and reliability tools and techniques to real world problems
- To Interpret the results of quality and reliability study for decision making

Teaching-Learning Process (General Instructions)

These are sample Strategies; that teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Videos/animation films to explain the content, wherever possible.
3. Encourage collaborative Learning (Group Learning) in the class.
4. Ask HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Show the different ways to solve the same problem and encourage the students to adopt creative ways to solve them.
7. Discuss how every concept can be applied to the real world thus helping to improve the students' understanding.
8. Individual teachers can device innovative pedagogy to improve teaching-learning.

MODULE-1

INTRODUCTION: Definition, Quality characteristics, Quality of design, conformance, and performance. Quality costs, Value of quality Vs Cost of quality, Quality control and Inspection, Introduction to SQC, TQC, TQM, and Quality Circles.

PROBABILITY DISTRBUTIONS: Variable and Attribute data, Definition of Probability and Basic laws, Probability distributions for Variables (Normal, Exponential and Weibull distributions) and Attributes (Hypergeomtric, Binomial and Poison's distributions), Numerical Exercises.

MODULE-2

STATISTICAL PROCESS CONTROL: Introduction, Sources of variation, Chance and Assignable causes of variation. Control Charts: basic principles and objectives, Aalpha (α) and Beta (β) errors, Analysis of Control chart patterns

CONTROL CHARTS FOR VARIABLES: Control charts for X-bar and range (R), X-bar and Standard deviation (σ), Development and use of these control charts. Estimation of Process capability, Relationship of Process capability with Specification Tolerance. Numerical Exercises.

MODULE-3

CNTROL CHARTS FOR ATTRIBUUTES: Variable Vs Attribute control charts. Defect Vs Defective, Control Chart for defectives: 'p' chart and 'np' chart, development and use of these control charts. Control Chart for defects: 'c' chart and 'u' chart, development and use of these control charts. Numerical Exercises.

QUALITY SYSTEMS: Introduction, Concept of Quality Audit, Quality Audit types, Need for quality systems, Introduction to ISO 9000, ISO 14000, ISO 27000, and ISO 50000 series quality systems.

MODULE-4

ACCEPTACE SAMPLING: Introduction to Acceptance Sampling, Sampling methods. Operating Characteristic (OC) curves, Producer's risk (α) and Consumer's risk (β), Acceptable Quality Level (AQL), Rejection Quality level (RQL/LTPD), Indifferent Quality Level (IQL), Average Outgoing Quality Limit (AOQL), Characteristics of OC curves. Single, Double, and Multiple Sampling Plans: Computing ATI, AFI, ASN, AOQL, Numerical Exercises.
Introduction to Item by item Sequential Sampling Plan.

MODULE-5

RELIBILTY: Introduction, Failure data analysis, Definition of MTTF, MTBF, MTBM, MTTR, MDT. Bathtub curve. Deriving an expression for Reliability. System Reliability: Series, Parallel, and Mixed configurations. Reliability improvement, Redundancy: Element, Unit, and Standby methods. Numerical exercises.

STATISTICAL TOLERANCING: Introduction, Statistical theorem, Tolerance of Parts and Assembly, Numerical exercises.

Course outcomes (Course Skill Set):

At the end of the course, the student will be able to:

1. Explain the fundamentals of Quality tools and techniques
2. Implement the quality and reliability tools and techniques in the real world scenario
3. Understand the results of quality and reliability study and use it for decision making

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

CIE for the theory component of the IPCC (maximum marks 50)

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**.
- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.
- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks)**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

CIE for the practical component of the IPCC

- **15 marks** for the conduction of the experiment and preparation of laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.
- On completion of every experiment/program in the laboratory, the students shall be evaluated including viva-voce and marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to **15 marks**.
- The laboratory test **(duration 02/03 hours)** after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks.**
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

4. Marks scoredby the student shall be proportionally scaled down to 50 Marks

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.

Suggested Learning Resources:

Books

1. Statistical Quality Control by Grant and Leavenworth Mc Graw-hill
2. Quality Planning and Analysis by J.M. juran and Frank M Gryna –Tata McGraw hill
3. Introduction to Statistical Quality Control by D. Montgomery –Johnwiley
4. Statistical Quality Control by R.C Gupta, Khanna publishers.
5. Statistical Quality Control by M Mahajan – Dhanpat Rai & sons.

Web links and Video Lectures (e-Resources):

- http://www.ru.ac.bd/stat/wp-content/uploads/sites/25/2019/03/405_02_Montgomery_Introduction- to-statistical-quality-control-7th-edtition-2009.pdf
- https://www.youtube.com/watch?v=tSbB5GtW1d0
- https://www.youtube.com/watch?v=uPTdz8mkxi8
- https://www.youtube.com/watch?v=os17KYZAnd0
- https://www.youtube.com/watch?v=X_JSyINygNg
- https://www.youtube.com/watch?v=Ugcb7Vlp0Ts
- https://www.youtube.com/watch?v=8XE56DbAGKM
- https://www.youtube.com/watch?v=328lcikqqs0
- https://www.youtube.com/watch?v=CmYpqVn3NoI
- https://www.youtube.com/watch?v=kRGQDaE_fSg
- https://www.youtube.com/watch?v=TFCcfl4DyUo
- https://www.youtube.com/watch?v=3GkDnw94Xxk
- https://www.youtube.com/watch?v=WSr6AU0InMk
- https://www.youtube.com/watch?v=d7Tl3E_lOMc
- https://www.youtube.com/watch?v=hmqsK_lifeI
- https://www.youtube.com/watch?v=kWLOwKC8JIs
- https://www.youtube.com/watch?v=TDPJ_ZareQY

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- At the end of the lecture/presentation, numerical exercises are to be taken up to solve problems related to the topics covered. Additional problems are to be given for practice and also as assignments under each ofthe topics covered.

Professional Elective Course

Industrial Robotics		Semester	VII
Course Code	**BIP714A**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	**Theory**		

Course objectives:

- To understand the basic concepts associated with the design and Functioning and applications of Robots
- To study about the drives and sensors used in Robots
- To learn about analyzing robot kinematics and robot programming

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Encourage collaborative Learning (Group Learning) in the class.
3. Ask HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking.

Module-1

FUNDAMENTAL CONCEPTS OF ROBOTICS: History, present status and future trends, Robotics. Robot, Definition. Robotics Systems and Robot Anatomy, Specification of Robotics. Resolution, Repeatability and Accuracy of a Manipulator.

ROBOT DRIVES: Power transmission systems and control Robot drive mechanisms, hydraulic-electric-penumatic drives. Mechanical transmission method – Rotary-to-Rotary motion conversion. Rotary-to-linear motion conversion end effectors – types-grip pind problem Remote-Centered compliance Devices- Control of Actuators in Robotic Mechanisms.

Module-2

SENSORS AND INTELLIGENT ROBOTS: Sensory devices – Non-optical-Position sensors – Optical position sensors – velocity sensors – proximity sensors: Contact and non-contact type- Touch and slip sensors – Force and Torque Sensors – AI and Robotics.

COMPUTER VISION FOR ROBOTICS SYSTEMS: Robot vision systems – Imaging components – Image representation – Hardware aspects-Picture coding – Object Recognition and Categorization Visual inspection – software considerations – applications – commercial – Robotics vision systems.

Module-3

COMPUTER CONSIDERATIONS FOR ROBOTIC SYSTEMS: Computer architecture for robts, hardware, Computational elements in robotic applications – Robot programming – sample programs path planning – Robot's computer system.

Module-4

TRANSFORMATIONS AND KINEMATICS: Homogeneous Co-ordinates – Co-ordinate Reference Frames – Homogeneous Transformations for the manipulator – the forward and inverse probleme of manipulator kinematics – Motion generation – Manipulator dynamics – Jacobian in terms of D.H.Matrices controller architecture.

Module-5

ROBOT CELL DESIGN AND CONTROL: Specifications of Commerical Robots – Robot Design and Process specifications – motor selection in the design of a robotic joint – Robot Cell layouts – Economic and Social aspects of robotics.

APPLICATIONS OF ROBOTS: Capabilities of Robots – Robotics Applications – Obstacle avoidance – Robotics in India – The future of Robotics

Course outcome (Course Skill Set)

At the end of the course, the student will be able to :

- At the end of the course the student will be able to :
- Analyze the manipulator design including actuator, drive and sensor issues
- Calculate the forward kinematics, inverse kinematics and Jacobian for serial and parallel robots
- Identify different types of end effectors and sensors required for specific applications
- Develop programming principles and languages for a robot control system
- Discuss various applications of industrial robot systems

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

5. The question paper will have ten questions. Each question is set for 20 marks.
6. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
7. The students have to answer 5 full questions, selecting one full question from each module.
8. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Robotics Engineering An integrated approach - Richard D Klafter, Thomas A Chmielewski, Michael Negin –Prentice Hall of India Pvt. Ltd. - Eastern Economy Edition, 1989
2. Robotics: Control Sensing, Vision, intelligence - Fu KS Gomaler R C, Lee C S G – McGraw Hill Book Co. - 1987.
3. Handbook of Industrial Robotics - Shuman Y. Nof - John Wiley & Sons, New York - 1985.
4. Robotics Technology and Flexible Automation - Deb SR - McGraw Hill BookCo. - 1994.

Web links and Video Lectures (e-Resources):

- https://intelitek.com/fundamentals-of-robotics/
- https://www.brainkart.com/article/Introduction-Robot-Drive-Systems_5132/
- https://www.electronicsforu.com/technology-trends/tech-focus/sensors-robotics-artificial-intelligence
- https://www.moldmakingtechnology.com/articles/10-considerations-for-choosing-a-robot
- https://onlinecourses.nptel.ac.in/noc20_me53/preview

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- At the end of the lecture/presentation, numerical exercises are to be taken up to solve problems related to the topics covered. Additional problems are to be given for practice and also as assignments under each ofthe topics covered.

Non Destructive Testing		Semester	VII
Course Code	**BIP714B**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	**Theory**		

Course objectives:

- To inspect a component in a safe, reliable and cost effective manner without causing damage to theequipment
- To weld inspectors can determine whether a weld is strong or has potential defects that could compromiseit integrity
- Ultrasonic testing is to detection of defect, measurement of their parameters assessment of their hazard assessment feasibility operation of the particular tested objected
- Liquid penetrant testing is to provide visual evidence of surface discontinuities in solid non-porous materials
- Magnetic Particle inspection is a NDT method, to detect surface and subsurface flaws in ferromagnetic Materials

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Arrange visits to nearby sites to give brief information about the Industrial and Production Engineeringstructures.
3. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations andVideo demonstrations or Simulations.
4. Show Video/animation films to explain the infrastructures and the mechanism involved in the principle.
5. Encourage collaborative (Group Learning) Learning in the class.

Module-1

Introduction: Definition of Non-destructive testing,Need for NDT techniques and its applications, Types of NDT techniques, benefits from Non-destructive Testing, nature of flaws ,various steps involved in NDT, uses of Non- destructive techniques.

Non-Destructive Testing of Welds: Definition of weld, types of weld joints, Welding processes; Gas welding, shielded metal arc welding, TIG spot welding, submerged arc welding, Defects in welded joints, Defects associated with residual stresses, Testing, measurement and control (TMC) of welds, Testing of welded joints; destructive test, Non-destructive tests.

Module-2

Ultrasonic Testing : Introduction frequency of ultrasonic Waves, Generation of Ultrasonic waves, Piezo-electric materials for Ultrasonic Transducers, Types of Ultrasonic Waves, Different kinds of Ultrasonic Transducers,Types of ultrasonic waves, Reflection, Refraction and scattering of Ultrasonic beam, working of ultrasonic Flaws detectors, industrial application, Pulse-echo and through transmission Testing, Scanner assemblies for transmission and pulse-echo techniques, types of scan, shear wave and surface wave applications, Resonance techniques, use of Ultrasonic for thickness measurements.

Module-3

Liquid Penetrant Testing: Types of Penetrants, Types of developers, Penetration time, Inspection, Post-emulsifiable fluorescent penetrants system, Water washable fluorescent penetrants, Low and High temperature penetrants, High sensitivity fluorescence penetrant examination, Advanced LPT techniques; Ultrasonic pumping to enhance performance, ultrasonically enhanced penetrant inspection of small weldments, Mechanised remote liquid penetrant testing of piping of reactors.

Module-4

Eddy current Testing: instrumentation of ECT, inspection of welds, advanced eddy current testing,Multi-frequency ECT, 3D phase array ECT, Remote field ECT, Magnetically based eddy current. Flux leakage, Computer modelling of ECT, Digital signal Processing, Eddy current imaging; eddy current imaging system, imaging and characterisation of defects, Eddy current array instrumentation for fixed position scanning.

Module-5

Magnetic particle Flaws detection: Principle of Magnetic Flaw detection, Types and methods of Magnetisation, Magnetic particles, Dry and Wet methods of Magnetic Particles inspection, Use of fluorescent Coated Magnetic particles, Industrial applications, Working of a Few Commercially available Magnetic Crack Detectors, Flaw detection in Rods, pipes and a short work piece, Precautions, Limitations, Residual magnetism, Need for Demagnetisation Research Techniques using Magnetic Particle Methods.

Course outcome (Course Skill Set)

At the end of the course, the student will be able to :

1. Students be able to inspect a component in a safe, reliable and cost effective manner without causing damage to the equipment
2. Students will understand the weld inspectors can determine whether a weld is strong or has potential defects that could compromise it integrity
3. Ultrasonic testing is to detection of defect, measurement of their parameters assessment of their hazard assessment feasibility operation of the particular tested objected
4. Liquid penetrant testing is to provide visual evidence of surface discontinuities in solid non-porous materials
5. Magnetic Particle inspection is a NDT method, to detect surface and subsurface flaws in ferromagnetic materials

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

9. The question paper will have ten questions. Each question is set for 20 marks.
10. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
11. The students have to answer 5 full questions, selecting one full question from each module.
12. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Non-Destructive Testing Techniques Ravi Prakash 3rd Edition 2010 New Age International (P) Ltd., publishers
2. Non-destructive Testing of Welds Baldev Raj C.V. Subramanian T. Jayakumar Revised Edditon 2000Narosa Publishing House
3. Welding Technology O.P. KhannaDhanpatRai Publication 2008
4. Welding and welding Technology Richard Little Tata McGraw hill 2005

Web links and Video Lectures (e-Resources):

- https://www.asnt.org/MajorSiteSections/About/Introduction_to_Nondestructive_Testing.aspx#:~:text=Nondestructive%20testing%20(NDT)%20is%20the,part%20can%20still%20be%20used.
- https://www.youtube.com/watch?v=tlE3eK0g6vU
- https://www.youtube.com/watch?v=9qw0Dka_YcU
- https://www.youtube.com/watch?v=qpgcD5k1494
- https://www.youtube.com/watch?v=bHTRmTQDZzg

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

1. Contents related activities (Activity-based discussions)
2. For active participation of students to learnt about welds, Ultrasonic, Liquid Penetrant, Eddy current andsome other testing of demonstration in Labs
3. Instruct the students individual to prepare module wise ppt
4. Organizing Group wise discussions and NDT based activities Quizzes and Discussions.

Operations Management		Semester	**VII**
Course Code	**BIP714C**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	**Theory**		

Course objectives:

- Learn about historial begining associated with operations management.
- Develop the forecasting of demands.
- Impart models used in decision making, Recognize and apply basic appropriate analytics.
- Interpret material scheduling and controlling of production activities.
- Develop schedules on single machine, flow shop and job shop.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type of teachingmethod may be adopted to develop the outcomes.
2. Encourage collaborative Learning (Group Learning) in the class.
3. Ask HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking.

Module-1

OPERATIONS MANAGEMENT CONCEPTS: Introduction, Historical development, The trend: Information and Non-manufacturing systems, Operations management, Factors affecting productivity.

OPERATIONS DECISION MAKING: Introduction, Management as a science, Characteristics of decisions, and Framework for decision making, Decision methodology, Decision support systems, Economic models, andStatistical models.

Module-2

FORECASTING DEMAND: Forecasting objectives and uses, Forecasting variables, Opinion and Judgmental methods, Time series methods, Exponential smoothing, Regression and correlation methods.

Module-3

AGGREGATE PLANNING AND MASTER SCHEDULING: Introduction- planning and scheduling, Objectives of aggregate planning, Aggregate planning methods, Master scheduling objectives, Master scheduling methods.

Module-4

MATERIAL AND CAPACITY REQUIREMENTS PLANNING: Overview: MRP and CRP, MRP:Underlying concepts, System parameters, MRP logic, System refinements, Capacity management, CRP activities.

SCHEDULING AND CONTROLLING PRODUCTION ACTIVITIES: Introduction, PAC, Objectives and Data requirements, Scheduling strategy and guide lines, Scheduling methodology, priority control, capacity control.

Module-5

SINGLE MACHINE SCHEDULING: Concept, measures of performance, SPT rule, Weighted SPT rule,EDD rule,minimizing the number of tardy jobs.

FLOW -SHOP SCHEDULING: Introduction, Johnson's rule for 'n' jobs on 2 and 3 machines, CDS heuristic. JOB- SHOP SHEDULING: Types of schedules, Heuristic procedure, scheduling 2 jobs on 'm' machines.

Course outcome (Course Skill Set)

At the end of the course, the student will be able to :

- At the end of the course the student will be able to :
- Apply the concepts of operations management by knowing the Historical development, Physical and information flows in a production system, and contribution of James Watt, Charles Babbage, Robert Owen, Thomas Alva Edition, Frederick Winslow Taylor, Henry Ford in development of production systems.
- Solve problems using appropriate techniques of forecast.
- Apply models used in decision making, Recognize and apply basic appropriate analytics.
- Apply material scheduling and controlling of production activities.
- Develop schedules on single machine,flow shop and job shop.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

13. The question paper will have ten questions. Each question is set for 20 marks.
14. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
15. The students have to answer 5 full questions, selecting one full question from each module.
16. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Operations Management Monks J.G McGraw Hill International Editions - 1987.
2. Production and Operations Management Pannerselvam. R PHI 2nd edition
3. Production and Operations Management Chary, S.N TataMcGraw Hill. 3rd edition

Web links and Video Lectures (e-Resources):

- https://www.investopedia.com/terms/o/operations-management.asp
- https://www.youtube.com/watch?v=Hy48AFKEepo
- https://www.shipbob.com/blog/demand-forecasting/
- https://www.youtube.com/watch?v=IDITxCjlyFE
- https://decisions.com/videos/scheduling-job-flow/

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- At the end of the lecture/presentation, numerical exercises are to be taken up to solve problems related to the topics covered. Additional problems are to be given for practice and also as assignments under each of the topics covered.

Tool Engineering and Design		Semester	**VII**
Course Code	**BIP714D**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	2:2:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	**Theory**		

Course objectives:

- To design and select single point cutting tools for various machining operations
- To to design and select multipoint cutting tools for various machining operations.

and exposure to variety of locating and clamping methods and design jigs

- To design fixtures and guages for simple components
- To design/selection procedure of press tools and
- To design Forming dies, Tool Layout and Cam Design of Single Spindle Automats.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Videos/animation films to explain the content, wherever possible.
3. Encourage collaborative Learning (Group Learning) in the class.
4. Ask HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
6. Show the different ways to solve the same problem and encourage the students to adopt creative ways to solve them.
7. Discuss how every concept can be applied to the real world thus helping to improve the students understanding.
8. Individual teachers can device innovative pedagogy to improve teaching-learning.

Module-1

Introduction: Concept, meaning and definitions of tool, tool design and tool engineering. Tools-types, classification, features & applications.

Design of Single Point Tool: Tool Signature, Selection of Tool Angles, Design of shank section for single point tool to account for strength and rigidity.

Module-2

Design of Multi Point Tools – Design of Drill, Design of peripheral Milling cutters, Design of Broach.
Location and Clamping: General principles of location, 3-2-1 Principle of Location, locating methods- plane , cylindrical and profile locators. General study of locating devices. General principles of clamping, Study of various Clamping devices.
Design of Jigs: Study of different types of Drill jigs like plate jig, solid jig, post jig, pot jig, turn over jig, box jig.

Module-3

Design of Fixtures: Difference between a Jig and a Fixture, Design of Milling fixture, Study of other fixtures Like simple milling fixture, line or string milling fixture, turning fixture, indexing drill jig, indexing milling fixture. Essential features of milling fixtures.
Design of Gauges: Types of gauges. Factors to be considered in the design of gauges, Design of Plug gauge and Design of Snap gauge.

Module-4

Design of Press Tools: A General study of Press operations. Elements of a Die, Strip layout, calculation of center of pressure. Design of Blanking Die, Design of Piercing Die, Design of Progressive Die.

Module-5

Design of Forming Dies: Study of Drawing and Bending process, Design of Drawing Die, Design of Bending Die
Tool Layout and Cam Design of Single Spindle Automats: Classification of Automats and their applications, automatic cutting off machine, single spindle, swiss type Automatic screw machine.
Tool layout and Cam design for automatic screw cutting machine.

Course outcome (Course Skill Set)

At the end of the course, the student will be able to :

- To develop capability to design and select single point cutting tools for various machining operations
- To develop capability to design and select multipoint cutting tools for various machining operations.

and Exposure to variety of locating and clamping methods and to enable the students to design jigs

- To enable the students to design fixtures for simple components and guages
- To expose the students to the design/selection procedure of press tools and
- To expose the students to the design Forming dies, Tool Layout and Cam Design of Single Spindle Automats.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
1. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
2. The students have to answer 5 full questions, selecting one full question from each module.
3. Marks scored shall be proportionally reduced to 50 marks.

Suggested Learning Resources:

Books

1. Text book of Production Engineering by P. C. Sharma, Chorotar Publishing house.
2. Tool Design by Donaldson and Golding, Tata McGraw Hill, New Delhi.
3. Jigs and Fixtures by P.H.Joshi, McGraw Hill Education, 3rd edition, 2010.
4. An introduction to Jig and Tool design by Kempester M.H.A., VIVA Books Pvt. Ltd, 2004.
5. Machine tool engineering by G. R Nagpal, knna publications, 2002.

Web links and Video Lectures (e-Resources):

- www.nptel.ac.in
- https://youtu.be/bUrp8JMRwx4
- https://youtu.be/hheFVuUBpxo
- https://youtu.be/K39bnxmIz7Q
- https://youtu.be/Hs_Pz80DD5Y
- https://youtu.be/HVbbSl5WreA
- https://youtu.be/SVo5ETboDTQ
- https://youtu.be/nfoUdm9WdE4
- https://youtu.be/6ZfAfjJTvvA
- https://youtu.be/nuCQTABjHLQ
- https://youtu.be/J_d8IRT9r7E
- https://youtu.be/LKEG3p3yx1g
- https://youtu.be/coLiMQ-hPvA

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Strip layout for few structures in A4 sheet.
- Pressing operation by clay.
- At the end of the lecture/presentation, numerical exercises are to be taken up to solve problems related to the topics covered.
- Additional problems are to be given for practice and also as assignments under each of the topics covered.

Open Elective Course

Project Management		Semester	VII
Course Code	**BIP755A**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	**Theory**		

Course objectives:

- To enable the students to understand the project management and its types.
- To help the students focus on and analyse the issues and strategies required to Project Selection and Prioritization
- To develop relevant skills necessary for Resourcing Projects and Budgeting the Projects.
- To enable the students to integrate the understanding of various Network Analysis.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Encourage collaborative Learning (Group Learning) in the class.
3. Ask HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking.
4. Individual teachers can device innovative pedagogy to improve teaching-learning.

Module-1

Introduction: Definition of project, characteristics of projects, understand projects, types of projects, scalability of project tools, project roles.

Project Selection and Prioritization: Strategic planning process, Strategic analysis, strategic objectives, portfolio alignment – identifying potential projects, methods of selecting projects, financial mode / scoring models to select projects, prioritizing projects, securing and negotiating projects.

Module-2

Planning Projects: Defining the project scope, Project scope checklist, Project priorities, Work Breakdown Structure (WBS), Integrating WBS with organisation, coding the WBS for the information system.

Scheduling Projects: Purpose of a project schedule, historical development, how project schedules are limited and created, develop project schedules, uncertainty in project schedules, Gantt chart.

Module-3

Resourcing Projects: Abilities needed when resourcing projects, estimate resource needs, creating staffing management plant, project team composition issues.

Budgeting Projects: Cost planning, cost estimating, cost budgeting, establishing cost control.

Project Risk Planning: Risk Management Planning, risk identification, risk analysis, risk response planning.

Module-4

Performing Projects: Project supply chain management: - Plan purchasing and acquisitions, plan contracting, contract types.
Project Progress and Results: Project Balanced Scorecard Approach, Internal project, customer, financial issues.

Network Analysis: Introduction, network construction - rules, Fulkerson's rule for numbering the events.
AON and AOA diagrams: Critical path method (CPM) to find the expected completion time of a project.
Float

Module-5

PERT for finding expected duration of an activity and project, determining the probability of completing a Project.
Predicting the completion time of project: Crashing of simple projects.

Course outcome (Course Skill Set)

At the end of the course, the student will be able to :

1. Understand the selection, prioritization and initiation of individual projects and strategic role of project management.
2. Understand the work breakdown structure by integrating it with organization.
3. Understand the scheduling and uncertainty in projects.
4. Students will be able to understand risk management planning using project quality tools.
5. Understand the activities like purchasing, acquisitions, contracting, partnering and collaborations related to performing projects.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Project Management by Timothy J Kloppenborg Cengage Learning, Edition 2009.
2. Project Management, A systems approach to planning scheduling and controlling by S Choudhury,
3. McGrawHill Education (India) Pvt. Ltd. New Delhi, 2016.
4. Project Management Pennington Lawrence McGraw hill.
5. Project Management A Moder Joseph and Phillips New Yark Van Nostrand, Reinhold.
6. Project Management Bhavesh M. Patal Vikas publishing House.

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=BOU1YP5NZVA
- https://www.simplilearn.com/project-selection-methods-article
- https://www.youtube.com/watch?v=DFL9FkIrXLI
- https://www.techtarget.com/searchcio/definition/project-planning
- https://www.ecosys.net/knowledge/scheduling-project-management-project-scheduling/
- https://www.workbreakdownstructure.com/
- https://docs.oracle.com/en/cloud/saas/project-management/22a/oapjs/how-project-progress-is-calculated.html
- https://www.youtube.com/watch?v=ljtGERVLF5U

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- At the end of the lecture/presentation, numerical exercises are to be taken up to solve problems related to the topics covered. Additional problems are to be given for practice and also as assignments under each ofthe topics covered.

Enterprise Resource Planning		Semester	VII
Course Code	**BIP755B**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	**Theory**		

Course objectives:

- To provide a contemporary and forward-looking on the theory and practice of Enterprise Resource PlanningTechnology.
- To focus on a strong emphasis upon practice of theory in Applications and Practical oriented approach.
- To train the students to develop the basic understanding of how ERP enriches the business organizations inachieving a multidimensional growth.
- To aim at preparing the students technological competitive and make them ready to self-upgrade with the higher technical skills.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Encourage collaborative Learning (Group Learning) in the class.
3. Ask HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking.

Module-1

INTRODUCTION TO ERP: Introduction, Evolution of ERP, What is ERP, Reasons for the growth of the ERP market, The advantages of ERP, Why do Man ERP Implementations Fail? Why are ERP packages being used now? **ENTERPRISE – AN OVERVIEW**: Introduction, Integrated Management Information, Business modelling,

IntegratedData Model

Module-2

ERP AND RELATED TECHNOLOGIES: Introduction, Business Process Reengineering, Management Information System, Decision Support System, Executive Information Systems, Data Warehousing, Data Mining, On-line Analytical Processing, Supply Chain Management

ERP- MANUFACTURING PERSPECTIVE: Introduction, ERP. CAD/CAM, Materials Requirements Planning, Bill of Material, Closed Loop MRP. Manufacturing Resource Planning, Distribution Requirements Planning

Module-3

KANBAN: JIT and Kanban, Product Data Management, Benefits of PDM, Make-to-order, and Make-to Stock, Assemble to order, Engineer to order, Configure-to order.

ERP MODULES: Introduction, Finance, Plant Maintenance, Quality Management, Materials Management.

Module-4

BENEFITS OF ERP: Introduction, Reduction of Lead time, On-time shipment, Reduction in Cycle Time, Improved Resource Utilisation, Better Customer Satisfaction, Improved Suppler Performance, Increased Flexibility, Reduced Quality Costs, Improved Information Accuracy and Decision – making capability.

ERP PACKAGES: Overview of ERP Software Introduction, SAP AG, Baan Company, Oracle Corporation, PeopleSoft, JD Edwards World Solutions Company, System Software Associates, Inc. QAD.

Module-5

ERP Implementation Life Cycle: Pre-Evaluations Screening, Package Evaluation, Project Planning Phase, Gap Analysis, Reengineering, Configuration, Implementation of Team Training, Testing, Going Live, end user Training, Post Implementation

VENDOR, CONSULTANTS AND USERS: Introduction, In-house implementation – Pros and Cons, Vendors, Consultants, End-users.

ERP- Case studies

Course outcome (Course Skill Set)

At the end of the course, the student will be able to :

1. Make use of Enterprise software, and its role in integrating business functions
2. Analyze the strategic options for ERP identification and adoption. L
3. Design the ERP implementation strategies.
4. Create reengineered business processes for successful ERP implementation.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

5. The question paper will have ten questions. Each question is set for 20 marks.
6. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
7. The students have to answer 5 full questions, selecting one full question from each module.
8. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Enterprise Resource Planning, Alexis Leon, Tata McGraw Hill Publishing Company Ltd, 1999
2. Enterprise esource Planning Concept and Practice, Vinod Kumar Garg and Venkitakrishnan, Prentice Hall,India 2nd Edition.
3. Manufacturing Planning & Controls Thomas Volloman, et,al.

Web links and Video Lectures (e-Resources):

- https://www.projectmanager.com/guides/resource-management
- https://www.youtube.com/watch?v=igssKXYS23A
- https://www.youtube.com/watch?v=1N9WbIP9S_g
- https://www.youtube.com/watch?v=1N9WbIP9S_g&list=RDCMUCObs0kLIrDjX2LLSybqNaEA&index=1
- https://www.youtube.com/watch?v=ssg6DTVfTSY

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- At the end of the lecture/presentation, numerical exercises are to be taken up to solve problems related to the topics covered. Additional problems are to be given for practice and also as assignments under each of the topics covered.

Design of Experiments		Semester	**VII**
Course Code	**BIP755C**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	**Theory**		

Course objectives:

- To learn how to plan, design and conduct experiments efficiently and effectively, and
- Analyze the resulting data to obtain objective conclusions.
- Both design and statistical analysis issues are discussed.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Videos/animation films to explain the content, wherever possible.
3. Encourage collaborative Learning (Group Learning) in the class.
4. Ask HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters student's Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.

Module-1

Introduction: Strategy of Experimentation, Typical applications of Experimental design, Basic Principles, Guidelines for Designing Experiments. Basic Statistical Concepts: Concepts of random variable, probability, density function cumulative distribution function. Sample and population, Measure of Central tendency; Mean median and mode, Measures of Variability, Concept of confidence level. Statistical Distributions: Normal, Log Normal & Weibull distributions. Hypothesis testing, Probability plots, choice of sample size. Illustration through Numerical examples.

Module-2

Experimental Design: Classical Experiments: Factorial Experiments: Terminology: factors, levels, interactions, treatment combination, randomization, Two-level experimental designs for two factors and three factors. Three-level experimental designs for two factors and three factors, Factor effects, Factor interactions, Fractional factorial design, Saturated Designs, Central composite designs. Illustration through Numerical problems.

Module-3

Analysis And Interpretation Methods: Measures of variability, Ranking method, Column effect method & Plotting method, Analysis of variance (ANOVA) in Factorial Experiments: YATE's algorithm for ANOVA, Regression analysis, Mathematical models from experimental data. Illustration through Numerical examples.

Module-4

Quality By Experimental Design: Quality, Western and Taguchi's quality philosophy, elements of cost, Noise factors causes of variation. Quadratic loss function & variations of quadratic loss function. Robust Design: Steps in Robust Design: Parameter design and Tolerance Design. Reliability Improvement through experiments, Illustration through Numerical examples. Experiment Design Using Taguchi's Orthogonal Arrays: Types of Orthogonal Arrays, selection of standard orthogonal arrays, Linear graphs and Interaction assignment, Dummy level Technique, Compound factor method, Modification of linear graphs. Illustration through Numerical examples.

Module-5

Signal To Noise Ratio: Evaluation of sensitivity to noise. Signal to Noise ratios for static problems: Smallerthe-better type, Nominal-the –better-type, Larger-the-better type. Signal to Noise ratios for Dynamic problems. Illustration through Numerical examples. **Parameter And Tolerance Design**: Parameter and tolerance design concepts, Taguchi's inner and outer arrays, parameter design strategy, tolerance design strategy. Illustration through Numerical examples.

Course outcome (Course Skill Set)

At the end of the course, the student will be able to :

- Appreciate the advantages and disadvantages of a design for a particular experiment.
- Construct optimal or good designs for a range of practical experiments.
- Understand the potential practical problems in its implementation.
- Describe how the analysis of the data from the experiment should be carried out.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

9. The question paper will have ten questions. Each question is set for 20 marks.
10. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
11. The students have to answer 5 full questions, selecting one full question from each module.
12. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

1. Design and Analysis of Experiments Douglas C. Montgomery Wiley India Pvt. Ltd 5th Edition, 2007
2. Quality Engineering using Robust Design Madhav S. Phadke Prentice Hall PTR, Englewood Cliffs, NewReference Books Jersy
3. Quality by Experimental Design Thomas B. Barker, Marcel Inc ASQC Quality Press.1985.
4. Experiments Planning, analysis, and parameter Design optimization, C.F. Jeff Wu Michael Hamada JohnWiley Editions 2002
5. Taguchi Techniques for Quality Engineering Phillip J. Ross McGraw Hill International Editions 2nd Edn. 1996

Web links and Video Lectures (e-Resources):

- www.nptel.ac.in
- https://youtu.be/pTAUa6qXV6E
- https://youtu.be/_Rgue-7KDww
- https://youtu.be/6DYtC7lrVuY
- https://youtu.be/Xg7ng3-Pm-8
- https://youtu.be/6o7wyyh8Lu8
- https://youtu.be/10ikXret7Lk

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- At the end of the lecture/presentation, numerical exercises are to be taken up to solve problems related to the topics covered. Additional problems are to be given for practice and also as assignments under each ofthe topics covered.

Supply Chain Management		Semester	**VII**
Course Code	**BIP755D**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	**Theory**		

Course objectives:

1. To develop an understanding of basic concepts and role of Logistics and supply chain management inbusiness.
2. To understand how supply chain drivers play an important role in redefining value chain excellence ofFirms.
3. To develop analytical and critical understanding & skills for planning, designing and operations of supply chain.
4. To understand, appraise and integrate various supply chain strategies.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Encourage collaborative Learning (Group Learning) in the class.
3. Ask HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking.
4. Individual teachers can device innovative pedagogy to improve teaching-learning.

Module-1

BUILDING A STRATEGIC FRAME WORK TO ANALYSE SUPPLY CHAINS: Supply chain stages and decision phase,process view of a supply chain. Supply chain flows. Examples of supply chains. Competitive and supply chain strategies. Achieving strategic fit. Expanding strategic scope. Drivers of supply chain performance. Framework for structuring drivers – Inventory, Transportation, Facilities, Information. Obstacles to achieving fit, Case discussions. **DESIGNING THE SUPPLY CHAIN NETWORK:** Distribution Networking – Role, Design. Supply Chain Network(SCN) – Role, Factors, Framework for Design Decisions.

Module-2

FACILITY LOCATION AND NETWORK DESIGN: Models for facility location and capacity allocation. Impact of uncertainty on SCN – discounted cash flow analysis, evaluating network design decisions using decision trees. Analytical problems.

PLANNING AND MANAGING INVENTORIES IN A SUPPLY CHAIN: Review of inventory concepts., Concepts of Safety Inventory, Concept of Aggregation of Inventory, Concept of product availability.

Module-3

SOURCING, TRANSPORTATION AND PRICING PRODUCTS: Role of sourcing, supplier – scoring & assessment, selection and contracts. Design collaboration. Role of transportation, Factors affecting transportation decisions. Modes of transportation and their performance characteristics. Designing transportation network. Trade-off in transportation design. Tailored transportation, Routing and scheduling in transportation. International transportation. Analytical problems. Role of Revenue Management in the supply chain, Revenue management for: Multiple customer segments, perishable assets, seasonal demand, bulk and spot contracts.

Module-4

COORDINATION AND TECHNOLOGY IN THE SUPPLY CHAIN: Co-ordination in a supply chain: Bullwhip effect. Obstacles to coordination. Managerial levers to achieve coordination, Building strategic partnerships. The role of IT supply Chain, The Supply Chain IT framework, CRM, Internal SCM, SRM. The role of e business in a supply chain, The e-business framework, e-business in practice. Case discussion.

Module-5

APPLICATION OF VALUE ANALYSIS: Application of Value analysis in the field of Accounting, Appearance Design, Cost reduction, Engineering, manufacturing, Management, Purchasing, Quality Control, Sales, marketing, Material Management Etc., Comparison of approach of Value analysis & other management techniques.

Course outcome (Course Skill Set)

At the end of the course, the student will be able to :

1. Recall the elements involved in strategic frame work and analysis of supply chains.
2. Demonstrate the elements involved in the design of supply chain networks
3. Demonstrate the facilities location for designing the supply chain network
4. Evaluate the inventories for supply chains.
5. Identify emerging concepts for supply chain networks

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

13. The question paper will have ten questions. Each question is set for 20 marks.
14. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
15. The students have to answer 5 full questions, selecting one full question from each module.
16. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books

- Supply Chain Management – Strategy, Planning, Sunil Chopra & Peter Meindl, Pearson Education Asia ISBN: 81-7808-272-1. – 2001
- Supply Chain and Logistics Management, UpendraKachuru
- Supply Chain Redesign –Transforming Supply Chains into Integrated Value Systems, Robert B Handfield, Ernest L Nichols, Jr. – Pearson Education Inc, ISBN: 81-7808- 272-1. – 2001.
- Modelling the Supply Chain, Jeremy F Shapiro, uxbury, Thomson Learning, McGraw Hill
- Designing & Managing the Supply Chain, David Simchi Levi, Philip Kaminsky& Edith Simchi Levi , McGrawHill

Web links and Video Lectures (e-Resources):

- https://www.gartner.com/en/topics/supply-chain-management
- https://www.youtube.com/watch?v=Mi1QBxVjZAw
- https://www.youtube.com/watch?v=TTojGYDDR18
- https://www.youtube.com/watch?v=AB7kmDmEbMI
- https://www.youtube.com/watch?v=o8APky4PGJA

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- At the end of the lecture/presentation, numerical exercises are to be taken up to solve problems related to the topics covered. Additional problems are to be given for practice and also as assignments under each of the topics covered.

Major Project Phase-II		Semester	VII
Course Code	**BIP786**	CIE Marks	100
Teaching Hours/Week (L:T:P: S)	0:0:12:0	SEE Marks	100
Total Hours of Pedagogy	--	Total Marks	200
Credits	06	Exam Hours	03
Examination type (SEE)	**Practical**		

VIII SEMESTER

Professional Elective (Online Courses)

TITLE OF THE SUBJECT		Semester	VIII
Course Code	**BIP801X**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	Theory/practical/Viva-Voce /Term-work/Others		

Open Elective (Online Courses)

TITLE OF THE SUBJECT		Semester	VIII
Course Code	**BIP802X**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03
Examination type (SEE)	Theory/practical/Viva-Voce /Term-work/Others		

Internship (Industry/Research)		Semester	VIII
Course Code	**BIP803**	CIE Marks	100
Teaching Hours/Week (L:T:P: S)	0:0:12:0	SEE Marks	100
Total Hours of Pedagogy	--	Total Marks	200
Credits	10	Exam Hours	03
Examination type (SEE)	**Practical**		