TULSIRAMJI GAIKWAD-PATIL College of Engineering and Technology
Wardha Road, Nagpur - 441108
Accredited with NAAC A+ Grade
Approved by AICTE, New Delhi, Govt. of Maharashtra
(An Autonomous Institution Affiliated to RTM Nagpur University, Nagpur)

Ref. No. TGPCET/2022-23/523 Date: 16/12/2022

Guidelines for Offering Open Elective to the PG Programmes

Introduction:

With reference to the AICTE model curriculum, following courses are approved in first academic council meeting of the institute to offer as an open electives in PG Engineering and MCA programmes. AICTE has clearly mentioned in its model curriculum that these open electives are offered to widen the skill sets. The list of open electives for PG (engineering) and MCA are as follows:

1. Business Analytics
2. Industrial Safety
3. Operation Research
4. Cost Management of Engineering Projects
5. Composite Materials
6. Waste to Energy

Offerings at Institute Level:

TGPCET offers Open Elective Courses (OEC) for the benefit of students. The list of OEC with respect to the host department is as given below:

Table 1: List of Open Electives offered by Host Programmes at PG level

Sr. No.	Name of Host Programme	Open Elective Course Code	Title of the Course
1.	Computer Science and Engineering	MCSXX01	Business Analytics
2.	Master of Business Administration	MMBXX02	Cost Management of Engineering Projects
3.	Structural Engineering	MSEXX03	Composite Materials
4.	Integrated Power Systems	MIPXX04	Waste to Energy
5.	Mechanical Engineering	MEDXX05	Industrial Safety
6.	Master of Business Administration	MMBXX06	Operation Research

In this regard, credits of OEC can be earned as follows:

1) In Post Graduate Programmes (PG) wherever OEC is a part of curriculum, A student has to mandatorily opt for an OEC from the approved list of courses only (as given in table 1) irrespective of the host department i.e. A student from M. Tech. CSE can opt for Business Analytics (as it's not part of their curriculum) though it has been offered by CSE department.

2) Student has to submit his/her choice by giving application to the HoD or by completing course registration through institute ERP (whichever is deemed suitable at that instance).

3) The decision of offering of any OEC is subjected to fulfill the criteria of minimum 20 no. of students opting for that course. Students are expected to give 03 (three) preferences to avoid inconvenience.

4) Host department will assign one Faculty as Faculty Coordinator for smooth execution of this mandatory OEC.

5) Faculty Coordinator is responsible for keeping track of all the students pertaining to this OEC.

6) Classes of OEC shall be conducted at the same time from all host departments. Slots for the same will be provided by Dean Academics of the institute.

7) Execution of OEC will be done as per scheme of instructions and examinations.

8) Scoring of student in OEC will be transferred directly to their credit card of End Semester Examination (ESE).

9) In case, if student is failed to clear OEC in ESE in that case re-sit examination of the course will be conducted and in this case student has to fill examination form of re-sit examination by paying prescribed fees at the institute.

10) Passing criteria shall be as per the scheme of examinations.

11) Equivalent Grade shall be shown in the transcript and accounted in the SGPA and CGPA calculations.

This guideline will come in force with immediate effect after its release from the office of Principal of the institute.

16/12/22

Dean Academics

Dean Academics
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16/12/22

Vice-Principal

Vice Principal
Tulsiramji Gaikwad-Patil
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16/12/22

Principal

Principal
Tulsiramji Gaikwad Patil College O
Engineering and Technology, Nagpu

Copy to: -HoDs, Registrar, Deans, CoE, All section Heads, etc.

C.c:-Hon'ble Chairman, GPG
Hon'ble Vice Chairman, GPG,
Hon'ble Treasurer, GPGI
All Directors, GPGI
} (for kind information)

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Program: PG (Open Elective) III Semester

MCSXX01 : Business Analytics

Teaching Scheme		Examination Scheme	
Theory	3 Hrs/week	**CT-I**	15 Marks
Tutorial	-	**CT-II**	15 Marks
Total Credits	3	**CA**	10 Marks
Duration of ESE: 3Hrs		**ESE**	60 Marks
Pre-Requisites: Data Science		**Total Marks**	**100 Marks**

Course Contents

Unit I	**Introduction to Data Science:** Introduction to Data Science – Overview of tools in Data Science – Data Science Methodology : Data Requirements – Data Understanding – Data Preparation – Data Modeling – Model Evaluation –Model Deployment – Model Feedback.
Unit II	**Introduction to Business analytics:** Overview of the strategic impact of BAI across key industries- Analytics 3.0-the nature of analytical competition- what makes an analytical competitor- analytics and business performance- Competing on Analytics with Internal and external Processes- A Road Map to Enhanced Analytical Capabilities- Managing Analytical People- The Architecture of Business Intelligence -Essential Practice Skills for High-Impact Analytics Projects: Listening to client, Framing the central problem, Scoping a project, Defining metrics for success, Creating a work plan, Assembling data and expert sources, Selecting modeling approaches, Validating and verifying analytical results, Communicating and presenting results to clients and Driving organizational change and assessing impact.
Unit III	**Descriptive Analytics:** Data Visualization and Analytics- Charts(Bars-Pie-Line-Scatter-Map-Bubble-Box & Whisker-Tree map - Heat map-Circle and Area) -Worksheet, Dashboard and Story Board creation
Unit IV	**Predictive Analytics:** Linear Regression, Cluster, CART and Neural Network model
Unit V	**Prescriptive Analytics:** Linear optimization, Integer optimization, Non-linear programming and Simulation

Text Books

T.1	Sharda R, Delen D, Turban E, Aronson J, Liang T. P, (2014), Business Intelligence and Analytics: Systems for Decision Support, 10th edition, Pearson Education.
T.2	Powell S. G, Barker K. R, (2014), Management Science: The Art of Modeling With Spreadsheets, (W/Cd), 4thedition, John Wiley & Sons.

Reference Books

R.1	Linoff G. S, Berry M. J, (2011), Data mining techniques: for marketing, sales, and customer relationship management, 3rd edition, John Wiley & Sons.
R.2	Frank B, Green B, Harris T, Van De Vanter K, (2010), Business Intelligence Strategy: A Practical Guide for Achieving BI Excellence, MC Press.
R.3	Hair, J. F, Black W. C, Babin B. J, Anderson R. E, Tatham R. L, (2009), Multivariate data analysis, 7th edition, Pearson education.

Useful Links	
1	https://onlinecourses.nptel.ac.in/noc21_cs68/preview
2	https://nptel.ac.in/

	Course Outcomes	CL	Class Sessions
MCSXX01.1	**Analyze** the role of data science and business analytics within an organization	4	8
MCSXX01.2	**Analyze** business analytics within an organization.	4	8
MCSXX01.3	**Apply** Descriptive Analytics Tools.	3	8
MCSXX01.4	**Develop and apply** predictive analytics models/tools to gain insight from data for business decision making	4	8
MCSXX01.5	**Develop and apply** prescriptive analytics models/tools to gain insight from data for decision making purpose.	5	8

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Program: PG (Open Elective) III Semester

MMBXX02: Cost Management and Engineering Projects

Teaching Scheme		Examination Scheme	
Theory	3 Hrs/week	CT-I	15Marks
Tutorial	-	CT-II	15 Marks
Total Credits	3	CA	10 Marks
Duration of ESE: 3Hrs		ESE	60 Marks
Pre-Requisites: Project Management		Total Marks	100 Marks

Course Contents

Unit I	**Introduction:** Introduction and Overview of the Strategic Cost Management Process
Unit II	**Cost Concepts:** Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost, Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision Making.
Unit III	**Project Management:** Meaning, Different types, why to manage, cost overruns centers, various stages of project execution: conception to commissioning. Pre project execution main clearances and documents. Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram
Unit IV	**Cost Behavior and Profit Planning:** Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement, Planning, Enterprise Resource Planning, Total Quality Management
Unit V	**Quantitative Techniques:** Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation Problems, Assignment problems, Simulation, Learning Curve Theory

Reference Books

R.1	Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi.
R.2	Charles T. Horngren and George Foster Advanced Management Accounting.
R.3	Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher
R.4	Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting

Useful Links

1	https://nptel.ac.in/courses/110104073
2	https://nptel.ac.in/courses/110101132
3	https://archive.nptel.ac.in/courses/105/106/105106149/

	Course Outcomes	CL	Class Sessions
MMBXX02.1	**Review** of strategic cost management	3	9
MMBXX02.2	**Evaluate** devise transfer pricing systems	5	10
MMBXX02.3	**Interpret** interactions between decentralized organizational	4	8
MMBXX02.4	**Create** profit maximizing behavior	5	9
MMBXX02.5	**Apply** various project management techniques	6	9

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Program: PG (Open Elective) III Semester

MSEXX03: Composite Materials

Teaching Scheme		Examination Scheme	
Theory	3 Hrs/week	**CT-I**	15Marks
Tutorial	-	**CT-II**	15 Marks
Total Credits	3	**CA**	10 Marks
Duration of ESE: 3Hrs		**ESE**	60 Marks
Pre-Requisites: Engineering Mechanics, Strength of Materials		**Total Marks**	**100 Marks**

Course Contents

Unit I	**Introduction to Composite Materials:** Definitions, Composite Material, Fiber, Matrix. Types of Fibers and Raw Fiber Properties, Types of Matrix, Prepegs, Fillers and other Additives
Unit II	**Advantages and Applications:** Advantages of Composite Materials and Structures. Applications and Use of Composite materials in present world
Unit III	**Basics of Composites:** Mechanical Behaviour of Composite Materials. Lamina, Laminate: The basic building block of a composite material
Unit IV	**Micromechanical Analysis of Composite Strength and Stiffness:** Properties of typical composite materials. Volume and Weight Fractions. Longitudinal Strength and Stiffness. Transverse Modulus. In-plane shear Modulus. Poisson's ratio
Unit V	**Analysis of Laminated Composites:** Laminates, Basic Assumptions, Strain-Displacement Relationship, Stress- Strain Relationships, Equilibrium Equations, Laminate Stiffness, Determination of Lamina Stresses and Strains, Types of Laminate Configuration, Balanced Laminate, Anti-symmetric Laminate

Reference Books

R.1	Mechanics of Composite Materials and Structures by Madhujit Mukhopadhyay
R.2	Mechanics of Composite Materials by R M Jones
R.3	Engineering Materials: Polymers, Ceramics and Composites A.K Bhargava Prentice Hall, India

Useful Links

1	https://nptel.ac.in/courses/112104168
2	https://nptel.ac.in/courses/101104010
3	https://nptel.ac.in/courses/112104229

	Course Outcomes	CL	Class Sessions
MSEXX03.1	**Review** of composite materials.	3	9
MSEXX03.2	**Evaluate** the applications of composite materials.	5	10
MSEXX03.3	**Analyze** the behavior of composite materials.	4	8
MSEXX03.4	**Estimate** the strength and stiffness of various composite materials.	5	9
MSEXX03.5	**Analyze** laminated composites.	4	9

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Program: PG (Open Elective) III Semester

MIPXX04: Waste to Energy

Teaching Scheme	
Lectures	3 Hrs/week
Tutorial	0 Hrs/week
Total Credit	3

Examination Scheme	
CT-1	15 Marks
CT-2	15 Marks
TA	10 Marks
ESE	60 Marks
Total	100 Marks
Duration of ESE: 03 Hrs	

Course Outcomes (CO)

Students will be able to

1	**Illustrate** the classification of waste and its conversion to different types of fuels.
2	**Apply** the concept of biomass pyrolysis for fuel extraction.
3	**Analyze** different types of biomass gasifier for thermal heating.
4	**Explain** different types of biomass combustion techniques.
5	**Categorize** the properties of biogas with respect to different types of fuel generation.

Course Contents		**Hours**
Unit I	Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors	(9)
Unit II	Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.	(9)
Unit III	Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.	(9)
Unit IV	Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.	(9)
Unit V	Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.	(9)

Text Books	
1	Non Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.
2	Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.
Reference Books	
1	Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.
2	Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996
Useful Links	
1	https://www.digimat.in/nptel/courses/video/103107125/L01.html
2	https://www.youtube.com/watch?v=tuUhQ62_dik

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Program: PG (Open Elective) III Semester

MEDXX05:Industrial Safety

Teaching Scheme	
Lectures	3 Hrs/week
Tutorial	0 Hrs/week
Total Credit	3

Examination Scheme	
CT-1	15 Marks
CT-2	15 Marks
TA	10 Marks
ESE	60 Marks
Total	100 Marks
Duration of ESE: 03 Hrs.	

Course Outcomes (CO)

Students will be able to

1	**Illustrate** the different parameters of industrial safety.
2	**Apply** the fundamentals of maintenance engineering for industrial safety and hazards.
3	**Analyze** the different types of corrosion and their preventive methods.
4	**Identify** the different types of faults and their prevention.
5	**Compare and discuss** periodic and preventive maintenance for industrial safety.

	Course Contents	**Hours**
Unit I	Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.	**(9)**
Unit II	Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.	**(9)**
Unit III	Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.	**(9)**
Unit IV	Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.	**(9)**
Unit V	Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies,	**(9)**

	of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance	

Text Books	
1	Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2	Maintenance Engineering, H. P. Garg, S. Chand and Company.
Reference Books	
1	Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
2	Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London
Useful Links	
1	https://www.youtube.com/watch?v=v-eltsixu4I
2	https://www.youtube.com/watch?v=At5G6GkW6Mk

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MMBXX06: Operation Research

Teaching Scheme		Examination Scheme	
Theory	3 Hrs/week	CT-I	15Marks
Tutorial	-	CT-II	15 Marks
Total Credits	3	CA	10 Marks
Duration of ESE: 3Hrs		ESE	60 Marks
Pre-Requisites: Project Management		Total Marks	100 Marks

Course Contents

Unit I	**Introduction to Operation Research:** Concept of Operation research, Main phases of operation research, Problem solving and decision making. Application of Operation research in Business.
Unit II	**Linear Programming & Game Theory**: Formulation of Linear Programming problems, graphical method for solution of LPP, Game models, 2 persons, zero sum games and their solutions. Solution of 2 x n and m x 2 games by graphical methods.
Unit III	**Assignment:** Assumptions and formulation of Assignment problems, Hungarian method, Maximization problems. Network Models - Shortest path problem, Successive shortest path problem, Maximum flow problem, Minimum Cost flow problem.
Unit IV	**Transportation:** Steps involved in transportation problems, Initial feasible solutions – NWCR, LCM, VAM, Testing degeneracy, testing optimality, MODI method. Travelling salesman Problem (TSP) - Branch and bound algorithm for TSP, Heuristics for TSP, Chinese Postman Problem, Vehicle Routing Problem.
Unit V	**PERT / CPM:** Network rules and network diagrams, calculation of Earliest Start and Finish Times, Latest Start and Finish Times, identification of critical path, and project duration.

Text Books

T.1	Operations Research, 7th Edition, PK Gupta & DS Hira, S Chand ISBN-13: 978-8121902816
T.2	Operations Research—Introduction to Management Science, Kanti Swaroop, PK Gupta, Man Mohan, Sultan Chand and Sons, ISBN-13: 978-9351611011
T.3	Operations Research: An Introduction, 9e Hamdy A Taha, Pearson Education India, ISBN-13: 978-9332518223

Reference Books

R.1	Operations Research: Principles and Applications, 3rd Edition, G. Srinivasan, PHI Learning Private Limited, ISBN-13: 978-8120353107
R.2	J K Sharma, Operations Research Problems Solution, McMillan Publication,
R.3	Operations Research: Principles and Applications, 3rd Edition, G. Srinivasan, PHI Learning Private Limited, ISBN-13: 978-8120353107

Useful Links	
1	Https://nptel.ac.in/courses/110/101/110101131/

	Course Outcomes	CL	Class Sessions
MMBXX06.1	**Apply** operation related problems by suggesting various operation research tools.	3	8
MMBXX06.2	**Analyze** LPP and Game Problems and find solutions for business decisions.	4	8
MMBXX06.3	**Evaluate** the assignment problems to find solutions.	5	8
MMBXX06.4	**Analyze** and evaluate Transportation problems to optimize costs.	4	8
MMBXX06.5	**Build** PERT/ CPM tools for optimizing time and cost in project management.	6	8

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