SCHEME & SYLLABUS

OF

M.TECH

TRANSPORTATION ENGINEERING

AND MANAGEMENT

w.e.f. 2018 -2019
(as per AICTE model scheme)

DEPARTMENT OF CIVIL ENGINEERING

YMCA UNIVERSITY OF SCIENCE AND TECHNOLOGY, FARIDABAD

SCHEME & SYLLABUS OF M.TECH – TRANSPORTATION ENGINEERING AND MANAGEMENT

YMCA UNIVERSITY OF SCIENCE AND TECHNOLOGY, FARIDABAD

M.TECH (TRANSPORTATION ENGINEERING & MANAGEMENT)

Curriculum Structure – Semester-wise

First Semester:

Subject Code	Subject Name	L-T-P	Credits	Marks Weightage		Course Type
				Internal	External	
MTTEM-101A	Transportation system planning	3-0-0	3	25	75	Core-I
MTTEM-102A	Highway & Airport pavement material	3-0-0	3	25	75	Core-II
MTTEM-103A	Discipline specific Elective-I	3-0-0	3	25	75	Programme Elective-I
MTTEM-104A	Discipline specific Elective-II	3-0-0	3	25	75	Programme Elective-II
RMI-101A	Research Methodology & IPR	2-0-0	2	25	75	Core
MTTEM-106A	Computational Laboratory	0-0-4	2	30	70	Core
MTTEM-107A	Transportation Engineering Laboratory	0-0-4	2	30	70	Core
AUD	Audit Course - 1	2-0-0	0	-	-	Audit
	Total	16-0-8	18	185	515	

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SCHEME & SYLLABUS OF M.TECH – TRANSPORTATION ENGINEERING AND MANAGEMENT

Discipline specific Elective-I

MTTEM-103A-1   Planning and Design of Airport

MTTEM-103A-2   Transportation Systems,Analysis & Modeling

MTTEM-103A-3   Geometric Design of

Highway

Discipline specific Elective-II

MTTEM-104A-1   High Rise Structure

MTTEM-104A-2   Numerical Method & AP

MTTEM-104A-3   Optimization methods   & its applications in Civil Engineering

Audit course 1 & 2

AUD-01A   English for Research Paper Writing

AUD-02A   Disaster Management

AUD-03A   Sanskrit for Technical Knowledge

AUD-04A   Value Education

AUD-05A   Constitution of India

AUD-06A   Pedagogy Studies

AUD-07A   Stress Management by Yoga

AUD-08A   Personality Development through Life Enlightenment Skills

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SCHEME & SYLLABUS OF M.TECH – TRANSPORTATION ENGINEERING AND MANAGEMENT

Second Semester:

Subject Code	Subject Name	L-T-P	Credits	Marks Weightage		Course Type
				Internal	**External**	
MTTEM-201A	Analysis & Structural design of pavements	3-0-0	3	25	75	Core-III
MTTEM-202A	Mass Transit System	3-0-0	3	25	75	Core-IV
MTTEM-203A	Discipline specific Elective-III	3-0-0	3	25	75	Programme Elective-III
MTTEM-204A	Discipline specific Elective-IV	3-0-0	3	25	75	Programme Elective-IV
MTTEM-205A	Traffic & Transportation Engineering Laboratory	0-0-4	2	30	70	Core
MTTEM-206A	Transportation Engg design practice lab	0-0-4	2	30	70	Core
AUD	Audit Course – 2	2-0-0	0	-	-	Audit
MTTEM-207A	Mini-Project	0-0-4	2	30	70	Core
	Total	**14-0-12**	**18**	**190**	**510**	

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Discipline specific Elective-III

MTTEM-203A-1   Bridge Engineering

MTTEM-203A-2   Highway Construction Practice

MTTEM-203A-3   Design & Constru. of Rural roads

Discipline specific Elective-IV

MTTEM-204A-1   Advanced Railway Engineering

MTTEM-204A-2   Strength & Deformation behaviour of soil

MTTEM-204A-3   Tunnel Engineering

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SCHEME & SYLLABUS OF M.TECH – TRANSPORTATION ENGINEERING AND MANAGEMENT

Third Semester:

Subject Code	Subject Name	L-T-P	Credits	Marks Weightage		Course Type
				Internal	External	
MTTEM-301A	Discipline specific Elective-V	3-0-0	3	25	75	Programme Elective-V
OEC	Open Elective	3-0-0	3	25	75	Open Elective
MTTEM-302A	Dissertation (Phase - I)	0-0-20	10	60	140	Dissertation
	Total	6-0-20	16	110	290	

Discipline specific Elective-V

MTTEM-301A-1   Traffic Engineering & Traffic flow theory

MTTEM-301A-2   Transportation & Environment

Open Elective

OEC-101A   Business Analytics

OEC-102A   Industrial Safety

OEC-103A   Operations Research

OEC-104A   Cost Management of Engineering Projects

OEC-105A   Composite Materials

OEC-106A   Waste to Energy

SCHEME & SYLLABUS OF M.TECH – TRANSPORTATION ENGINEERING AND MANAGEMENT

Fourth Semester:

Subject Code	Subject Name	L-T-P	Credits	Marks Weightage		Course Type
				Internal	**External**	
MTTEM-401A	Dissertation (Phase - II)	0-0-32	16	180	420	Dissertation
	Total	**0-0-32**	**16**	**180**	**420**	

Total Credits for the programme = 18 + 18 +16 +16 = **68**

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Semester I

MTTEM-101A   Transportation System Planning

No. of Credits: 3

L T P Total

3 0 0   3

Sessional: 25 Marks

Theory : 75 Marks

Total : 100 Marks

Duration of Exam: 3 Hours

Course Objectives:

To study various techniques of transportation system planning in urban and rural areas to avoid various problems occurs in mix traffic. To study essential concepts of transportation planning. To understand the traffic survey.

Course Outcomes:

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

1. Analysis of future condition of transportation.

2. Understand the urban and regional transportation systems.

3. Understand traffic survey

4. Understand analysis of traffic for future condition

Syllabus Contents

UNIT - I

Brief description of urban and regional transportation systems,technical terms in transportation system.

UNIT – II

Definition of a system;System analysis:scope and limitations,Transportation planning based upon system analysis,survey and analysis of existing conditions.

UNIT – III

models for trip generation ,trip distribution,traffic assignment and Modal split;Analysis of future conditions,Plan synthesis and evaluation

UNIT – IV

Description of transportation network ,Route choice behaviour,minimum path,route assignment techniques ,multipath traffic assignment

Reference Books:

1. L.R Kadyali, Traffic Engineering and Transportation Planning, Khanna publishers , 7th Edition, 2008
2. C.S Papacostas, P.D Prevedouros, Transportation Engineering and Planning, PHI Publication, 3rd Edition , 2002
3. M.J Bruton, Introduction to Transportation planning(Built Environment), Routledge, 1992
4. J.D Fricker R.K Whitford,Fundamentals of transportation engineering:A Multimodal system approach,Pearson Education ,PH, 2005
5. Ortuzar Willumsen, Modeling Transport, John wiley, 1990

MTTEM-102A Highway & Airport pavement material

No. of Credits: 3

L T P Total

3 0 0   3

Sessional: 25 Marks

Theory : 75 Marks

Total : 100 Marks

Duration of Exam: 3 Hours

Course Objectives:

To know the characteristics of various materials used in the construction of highway & airport. To design the highway and airport. To understand about various layers of pavement and the materials used in respective layers.

Course Outcomes:

At the end of the course, the student shall be able to:
1. Understand the materials used in the pavement of highways & airports.

2. Understand Analyse and design the highway & airport

3. Understand the mixes for various kinds of roads

4. Understand conventional & non conventional materials

Syllabus Contents

UNIT - I

Conventional aggregates and their evaluation,applications, advantages and limitations of conventional aggregates.

UNIT – II

Bituminous binders –Properties, testing And Applications;Bituminous mixes- Design , Testing and Evaluation;

UNIT – III

Materials for Cement Concrete and semi-rigid pavements, Design of mixes for stabilized roads; construction and maintenance of rigid pavements

UNIT – IV

Non-conventional and new pavement materials – their applications and limitations.

Reference Books:

1. Atkins & Harold, Highway Materials,Soils,and concretes,Prentice hall Pearson, 4th Edition, 2003

2. Y. Richard Kim, Modeling of asphalt concrete, 2008, Mc Graw Hill Professional.

3. Relevant IRC, ASTM, AASTHO, and other codes, Manuals and Specifications

4. P.G Lavin, Aphalt Pavements , Taylor and Francis, 1st Edition, 2007

MTTEM-103A-1   Planning and Design of airports

No. of Credits: 3	Sessional: 25 Marks
L T P Total	Theory : 75 Marks
3 0 0 3	Total : 100 Marks
	Duration of Exam: 3 Hours

Course Objectives:

To study about design of pavement for airports;to understand the technical terms used in airport engineering. To know about planning and scheduling the roads construction for airport;to know about the mix design for pavement construction.

Course Outcomes:

At the end of the course, students will demonstrate their ability to:

1. Understand design principles of critical,semi-critical,non-critical airport pavements
2. Understand various components of airport
3. Understand design criteria of airport pavements
4. Understand airport terminal amenities

Syllabus Contents:

UNIT - I

Classification of airports- ICAO standards ; Planning for airport- Airport components- Zoning laws ; Runways- orientation and geometric design-Runway patterns ;

UNIT – II

Taxiways- alignment geometry and turning radius- exit taxiways ; Aprons- planning and design ;

UNIT - III

Design principles of critical, semi-critical, non-critical airport pavements- FAA and PCA methods ; Airport hangars- their planning and design criteria ;

UNIT - IV

Airport landscaping, grading and drainage general aspects ; Airport terminal and amenities ; Airport lighting and marking.

Reference Books:

1. N.J. Ashford, P.H. Wright, *Airport Engineering*, 3rd Edition, 1992, John Wiley

2. R.M. Horonjeff, F.X. Mc Kelvey, W.J Sproule, *Seth Young, Planning and Design of Airports*, *TMH International Publishers*, Fifth Edition, 2009

3. Khanna, Arora and Jain, *Planning and Design of Airports*, Nemchand Bros., 2001

4. Wells, Alexander; Young, Seth, *Airport Planning & Management*, McGraw Hill,5th Edition, July,2009

5. De N. Richard, & Odoni, *Airport Systems: Planning, Design, and Management*, McGraw Hill Amedeo, 1st Edition, 2004.

MTTEM-103A-2   Transportation systems,Analysis & Modeling

No. of Credits: 3   Sessional: 25 Marks

L T P Total   Theory : 75 Marks

3 0 0   3   Total : 100 Marks

                                                 Duration of Exam: 3 Hours

Course Objectives:

To study essential concepts of transportation system. To study various technical terms used in transportation. To know about the data collection and application of models.

Course Outcomes:

At the end of the course, students will demonstrate their ability to:

1. Understand Analyse the future forecast using models.

2. Understand the land use and transportation interaction.

3. Understand evaluation and analysis of transportation system.

4. Understand intelligent transport system.

Syllabus Contents:

UNIT - I

        Systems modeling- definitions ; Transport models, Model building kit, Mathematical modeling and its calibration, Data collection and application of models ;

UNIT – II

        Land use and transportation interaction ; Future forecasts using models ; Evaluation and analysis of transportation systems.

YMCA UNIVERSITY OF SCIENCE AND TECHNOLOGY, FARIDABAD

UNIT – III

Introduces transportation systems analysis, stressing demand and economic aspects. Covers the key principles governing transportation planning, investment, operations and maintenance.

UNIT – IV

project evaluation; covering urban passenger transportation, freight, aviation and intelligent transportation systems.

Reference Books:

1. Modern Welding Technology: by Howard B. Cary and Scott C. Helzer, (Pearson Education)

2. Welding and Welding Technology: by R. Little (TMH)

3. Welding Processes and Technology: by R. S. Parmar (Khanna Publishers)

4. AWS- Welding Handbook.

MTTEM-103A-3   Geometric Design of Highway

No. of Credits: 3   Sessional: 25 Marks

L T P Total   Theory : 75 Marks

3 0 0   3   Total : 100 Marks

                                             Duration of Exam: 3 Hours

Course Objectives:

To study concepts of highways in urban and rural areas;to know all the terms used in highway.

To understand the informatory signs,to know the concept of superelevation ,curve ,gradient etc.

Course Outcomes:

At the end of the course, students will demonstrate their ability to:

1. Understand Analyse & design the superelevations provided on the horizontal curves.

2. Understand all the technical terms used in the highway geometrics.

3. Understand the informatory signs and signals.

4. Understand stopping and overtaking sight distance.

Syllabus Contents:

UNIT - I

Introduction:- Importance of geometric design, design controls and criteria; Highway cross section elements: Pavement unevenness, camber, carriage way, traffic separators, kerbs, road margins, right of way;

UNIT – II

Sight distance : Stopping sight distance (SSD), PIEV Theory, OSD, Overtaking zones, Sight distance at intersections;

UNIT – III

Designs of Horizontal alignment: Design speed, horizontal curves, super elevation, radius of horizontal curves, widening of pavement on horizontal curves;

UNIT – IV

Horizontal transition curve: Objects of providing transition curves and its types; Design of vertical alignment: Gradient, vertical curves.

Reference Books:

1. L.R. Kadiyalli, *Traffic Engineering and Transport Planning*, Khanna Publishers, 7th Edition, 2008.

2. C.A.O'Flaherty, *Transport Planning and Traffic Engineering*, Arnold, 1997.

3. R. P. Roess, E. S. Prassas, & W.R. Mc Shane, *Traffic Engineering*, Prentice Hall, 3rd Edition, 2004

4. May, *Traffic Flow Fundamentals*, Prentice Hall, 1989

5. F. L. Mannering, *Principles of Highway Engineering and Traffic Analysis*, 4th Edition, 2008, John Wiley

MTTEM-104A-1   High Rise Structure

No. of Credits: 3	Sessional: 25 Marks
L T P Total	Theory : 75 Marks
3 0 0 3	Total : 100 Marks
	Duration of Exam: 3 Hours

Course Objectives:

To study the basic concepts regarding design and manufacture of components of high rise buildings. To analyse and design the high rise structures and to understand the technical terms used in high rise structure engineering.

Course Outcomes:

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

1. Understand analyse the shear wall.
2. Understand Analyse and design the footings for high rise buildings.
3. Understand design the time period of a high rise structure .
4. Understand three dimensional analysis of tall buildings.

Syllabus Contents:

UNIT - I

Analysis of tall building frames, Lateral load analysis, multi bay frames, gravity loads, settlement of foundation.

UNIT – II

Analysis of shear walls - plane shear walls, in filled frames, coupled frames, frames with shear walls.

UNIT – III

Principle of three dimensional analysis of tall buildings; perforated cores, pure torsion in thin tubes, bending and warping of perforated cores.

UNIT – IV

Analysis of floor system in tall buildings, Vierendal girders, diagrid floors. Elastic and inelastic stability of frames and shear walls. Analysis of thermal stresses.

Reference Books:

1. B S Smith & A Coull, *Tall Building Structures: -* John Wiley & Sons.
2. W. Schueller, *High Rise Building Structures*: John Wiley & Sons.

MTTEM-104A-2   Numerical Methods & Applied Statistics

No. of Credits: 3	Sessional: 25 Marks
L T P Total	Theory : 75 Marks
3 0 0 3	Total : 100 Marks
	Duration of Exam: 3 Hours

Course Objectives:

To Solve ordinary and partial differential equations in structural mechanics using numerical methods. Write a program to solve a mathematical problem

Course Outcomes:

At the end of the course, students will demonstrate their ability to:

1. Understand to solve ordinary and partial differential equations in structural mechanics using numerical methods.

2. Understand to write a program to solve a mathematical problem.

3. Understand Gaussian elimination and gauss Jordan method.

4. Understand linear programming.

Syllabus Contents

UNIT - I

Linear system – Gaussian elimination and Gauss – Jordan methods – matrix inversion – Gauss seidel method -Nonlinear equations – Regula falsi and Newton- Raphson methods – interpolation – Newton's and Lagrange's interpolation

UNIT – II

Linear Programming – Graphical and Simplex methods – Measures of central tendency, dispersion, skewness and Kurtosis – Probability – conditional probability – Bayes' theorem

Random variable – two dimensional random variables – standard probability distributions – Binomial Poisson and normal distributions - moment generating function

UNIT - III

Sampling distributions – confidence interval estimation of population parameters – testing of hypotheses – Large sample tests for mean and proportion – t-test, F-test and Chi-square test – curve fitting-method of least squares

UNIT - IV

Regression and correlation – rank correlation – multiple and partial correlation

– analysis of variance one way and two way classifications – experimental design – Latin square design – Time series analysis.

Reference Books:

1. Bowker and Liberman, Engineering Statistics, Prentice-Hall, 1972.

2. Venkatraman, M.K., Numerical Methods in Science and Engineering, National Publisher Company

MTTEM-104A-3   Optimization methods & its applications in Civil engineering

No. of Credits: 3
L T P Total
3 0 0   3

Sessional: 25 Marks
Theory : 75 Marks
Total : 100 Marks
Duration of Exam: 3 Hours

Course Objectives:

To study various theories of optimization methods and its applications in civil engineering

Course Outcomes:

At the end of the course, students will demonstrate their ability to:

1. Understand optimization methods and its applications
2. Understand multi variable optimization methods
3. Understand gradient based method by newton raphson method
4. Understand gradient based method by Fletcher reeve method

Syllabus Contents

UNIT - I

Introduction: Need for engineering optimal design, Optimum design formulation: Design variable, objective function and constraints ; Unconstrained optimization methods Single variable optimization methods: Region elimination method Golden section search, Interval halving method

UNIT – II

 Gradient based method Newton-Raphson, bisection and secant method. Multi variable optimization methods: Direct search method: Hooke-Jeeve pattern search, rection search.

UNIT – III

Gradient Based methods:- Fletcher-Reeve method ; Constrained optimization methods Kuhn Tucker condition, Penalty functionmethod, Augmented Lagrangian method, sequential unconstrained minimization, cutting plane method; Introduction to Evolutionary algorithms: Need for evolutionary algorithms, Type of evolutionary methods,

UNIT – IV

 Introduction to Genetic algorithm (GA), Difference and similarities between GA and traditional methods. Basic operations of GA: reproduction, crossover, mutation and elitism. Binary coded and Real coded GA ; Application of Optimization techniques: Water resource planning management, Structural Optimization, Transportation planning and Management, Slope stability and optimal dimensioning of foundations. multi-objective optimization models.

Reference Books:

Essential Reading:

1. J.S. Arora, Introduction to Optimum Design, Elsevier, 2nd Edition, 2004.

2. K. Deb, Optimization for Engineering. Design: Algorithms & Examples, Prentice Hall

   India, 2006

Supplementary Reading:

   1. S.S. Rao, Engineering Optimization: Theory & Practice , New Age International (P) Ltd, 3rd Edition, 1996, Reprint : June, 2008.

   2. K. Deb, Multi-objective Optimizations using Evolutionary Algor.

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MTTEM-106 A   Computational Laboratory

No. of Credits: 2   Sessional: 30 Marks

L T P Total   Theory : 70 Marks

0 0 4   4   Total : 100 Marks

Course Objectives:

At the end of the course, students will be able to   solve the problems related to civil engg by using matrix method

Course Outcomes:

At the end of the course, students will demonstrate their ability to:

1. Students will be able to solve the problems related to civil engineering by using matrix method

Syllabus Contents:

Computer programming in C++. ; Development of computer programs to solve problems related to civil engineering using matrix method

MTTEM-107 A   **Transportation Engineering Laboratory**

No. of Credits: 2	**Sessional: 30 Marks**
L T P Total	**Theory : 70 Marks**
0 0 4 4	**Total : 100 Marks**

Course objectives:

To know about the characteristics of different construction materials and the grade of bitumen and to perform all the tests conducted on them to know their properties .

Course outcomes:

1. To know the grade of the bitumen.

2. To perform all the tests on aggregate and sand like los angeles test and CBR test.

Syllabus Contents:

- Penetration Ratio and Penetration Viscosity Number of Bituminous binders

- 10% Fineness Test for aggregates

- Moisture sensitivity test for bitumen adhesion

- Viscosity-Temperature relationships for bituminous binders

- Rheological properties of bituminous binders

- Design of Bituminous mixes

RMI-101A   Research Methodology and IPR

No. of Credits: 3	Sessional: 25 Marks
L T P Total	Theory : 75 Marks
3 0 0 3	Total : 100 Marks
	Duration of Exam: 3 Hours

Course Outcomes:

At the end of the course, students will demonstrate their ability to:

1. Understand research problem formulation.

2. Analyze research related information.

3. Follow research ethics

4. Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.

5. Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.

6. Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

Syllabus Contents:

Unit I: Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations.

Unit II: Effective literature studies approaches, analysis Plagiarism, Research ethics.

Unit III: Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.

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Unit IV: Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

Unit 5: Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

Unit 6: New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Reference Books:

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'"

2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"

3. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"

4. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.

5. Mayall , "Industrial Design", McGraw Hill, 1992.

6. Niebel , "Product Design", McGraw Hill, 1974.

7. Asimov , "Introduction to Design", Prentice Hall, 1962.

8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age", 2016.

9. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008.

Semester II

MTTEM-201A   Analysis and Structural design of pavements

No. of Credits: 3	Sessional: 25 Marks
L T P Total	Theory : 75 Marks
3 0 0 3	Total : 100 Marks
	Duration of Exam: 3 Hours

Course Objectives:

To study about the analysis and design of roads. To design the flexible and rigid pavement . to understand the guidelines of IRC and CRRI .

Course Outcomes:

At the end of the course, students will demonstrate their ability to:

1. Understand Analyse structural design of roads.

2. Understand Design flexible and rigid pavements.

3. Understand IRC guidelines.

4. Understand load and temperature stresses.

Syllabus Contents:

UNIT - I

Theories of pavement design, Factors affecting pavement design; Methods of flexible pavement design- applications of CBR, Burmister, Asphalt Institute, AASHTO and IRC Methods.

UNIT – II

Load and temperature stresses in rigid pavements-Westergaad's, Bradburry's and Pickets concepts; Design of rigid pavements by PCA, AASHTO and IRC methods

YMCA UNIVERSITY OF SCIENCE AND TECHNOLOGY, FARIDABAD

UNIT – III

Design of joints in rigid pavements; Evaluation of pavement distress; Design aspects of flexible and rigid overlays.

UNIT - IV

Guidelines and functions of IRC,NHAI,CRRI,AASTHO,methods of rigid pavement design,conventional and non conventional materials.

Reference Books:

1.   Yoder and Witzack, *Principles of Pavement Design*, John Willey and Sons, October 1975

2. Yang H. Huang, *Pavement Analysis and Design*, PH, 2nd Edition, 2004.

3. *Relevant IRC, ASTM, AASHTO and other Codes*, Manuals and Specifications

4. D. Croney & P. Croney, *the Design and Performance of Road Pavements*, Mc Graw Hill Professional, 3rd Edition. 1998 Richard J Salter, *Highway design and construction*, Palgrave Macmillan, 1988

MTTEM-202A   Mass Transit System

No. of Credits: 3   Sessional: 25 Marks

L T P Total   Theory : 75 Marks

3 0 0   3   Total : 100 Marks

                                                                   Duration of Exam: 3 Hours

Course Objectives:

Study the basic concepts of plan ,construct and operate the modes of mass transit.

Course Outcomes:

At the end of the course the students should be able to:

1. Understand Plan ,construct and operate the modes of mass transit.

2. Understand trip interchanges and assignments.

3. Understand modes of mass transit.

4. Understand case studies.

Syllabus Contents:

UNIT - I

      Mass Transit concepts- Trip interchanges and assignments ; Urban transportation problems

UNIT – II

Modes of mass transit- their planning, construction and operation

UNIT – III

 Case studies of existing mass transit systems ; Technical and economic evaluation of mass transit projects.

 UNIT – IV

 Urban transportation problems and their solution aspects

YMCA UNIVERSITY OF SCIENCE AND TECHNOLOGY, FARIDABAD

Reference Books:

1. C. S. Papacostas, P. D. Prevedouros, *Transportation Engineering and Planning*, PHI Publication, 3rd edition, 2002

2. S. Grava, *Urban Transportation Systems*, Mc. Graw Hill Professional, 1st Ed. 2002.

   3.J.D. Fricker, & R.K. Whitford, *Fundamentals of Transportation Engineering*, Pearson, PH, 2004

4. V.R. Vuchic, *Urban Transit Systems and Technology*, John Wiley & Sons, February 2007

5. C.A. O'Flaherty, *Transport Planning and Traffic Engineering*, Arnold, 1997

6. J. E. Anderson, *Transit Systems Theory*, Lexinton Books, USA

MTTEM-203A-1   Bridge engineering

No. of Credits: 3

L T P Total

3 0 0   3

Sessional: 25 Marks

Theory : 75 Marks

Total : 100 Marks

Duration of Exam: 3 Hours

Course Objectives:

To know about the bridges ,their types and classification of bridges. To study about the repair and maintenance of bridges. To study about the bridge foundations.

Course Outcomes:

At the end of the course the students should be able to:

1. Understand design and construct the road joints.

2. Undserstand Design bridge foundation.

3. Understand repair and maintenance of bridges.

4. Understand construction joints.

Syllabus Contents:

UNIT - I

Introduction, historical review, engineering and aesthetic requirements in bridge design. Introduction to bridge codes. Economic evaluation of a bridge project. Site investigation and planning;.

UNIT – II

Scour - factors affecting and evaluation. Bridge foundations - open, pile, well and caisson. Piers, abutments and approach structures; Superstructure - analysis and design of right, skew and curved slabs.

UNIT – III

Girder bridges - types, load distribution, design. Orthotropic plate analysis of bridge decks. Introduction to long span bridges - cantilever, arch, cable stayed and suspension bridges.

UNIT – IV

Methods of construction of R.C Bridges, Prestressed concrete bridges and steel bridges Fabrication, Launching & creation. Design and construction of construction joints.

Reference Books:

1. V. K. Raina, *Concrete Bridges Practice Analysis, Design and Economics*, Shroff Publications, New Delhi 2nd Ed. 2005.
 2. Vazirani, Ratwani and Aswani, *Design of Concrete Bridges*, Khanna Publishers, 2nd Ed. 2008.
 3. IRC codes for Road bridges- IRS Sec I , II, III
 4. IRS Codes of Practice for Railway bridges.
 5. B. M. Das, *Principles of Foundation Engineering,* Thomson, Indian Edition, 2003.

MTTEM-203A-2 Highway Construction Practice

No. of Credits: 3   Sessional: 25 Marks

L T P Total   Theory : 75 Marks

3 0 0   3   Total : 100 Marks

                                                       Duration of Exam: 3 Hours

Course Objectives:

To study about design the retaining walls in hilly areas and use of conventional and non-conventional materials in highways.

Course Outcomes:

At the end of the course students will be able to

1. Understand the design of retaining walls in hilly areas.

2. Understand use of conventional and non-conventional materials in highways.

3. Understand various construction joints.

4. Understand road construction equipments.

Syllabus Contents:

UNIT - I

Embankment, formation cutting in soil and hard rock, sub grade; ground improvement;

UNIT – II

Retaining walls on hill roads,its construction ,types,advantages and disadvantages of retaining wall.

UNIT - III

granular & stabilized sub bases/bases; bituminous surfacing; Recycled pavements; concrete roads;

UNIT – IV

non conventional pavements; road construction equipments,pavement layers and materials used in different layers.

Reference Books:

1. MOST, Specifications for Road and Bridge Work (4th Revision), Ministry of Road Transport and Highways, 2001.

2. C. A. O' Flaherty, Highways – The Location, Design, Construction, & Maintenance of Pavements, Butterwsorth Heinemann, 2002.

3. R. N. Hunter, Bituminous Mixtures in Road Construction, Thomas Telford Services Ltd., 1995.

4. P. H. Wright, Highway Engineering, John Wiley & Sons, 1996.

5. C. H. Oglesby, and R. G. Hicks, Highway Engineering, John Wiley & Sons, 198.

MTTEM-203A-3 Design and construction of rural roads

No. of Credits: 3

L T P Total

3 0 0   3

Sessional: 25 Marks

Theory : 75 Marks

Total : 100 Marks

Duration of Exam: 3 Hours

Course Objectives:

To understand the construction method and techniques used in roads,to know about the classification of roads and maintenance of roads.

Course Outcomes:

At the end of the course, students will demonstrate their ability to:

1. Understand the construction method & techniques used in roads.

2. Know about the classification of roads & maintenance of roads.

3. Understand problems during construction in rural roads.

4. Understand various techniques used technical terms.

Syllabus Contents

UNIT - I

Rural Road Development; Introduction to Rural Road Construction Scheme in India and its Objectives; Classifications of Roads

UNIT – II

Importance of Rural Road Connectivity; Planning of Rural Roads Core Network;duties and functions of IRC,CRRI,NHAI,MORTH

UNIT - III

Preparation of DPR; Specification of Rural Roads; Use of Alternate Materials in Rural Roads; Construction Methods and Techniques Used in Rural Roads

UNIT – IV

Quality Control in Rural Road Construction Projects; Maintenance of Rural Roads,problems during construction of rural roads.

Reference Books:

1. Brown, J. Victor, and C. N. Conner, Low cost roads and bridges, Gillette Co. Publications, 1933.

2. K. N. Ramanujam, Rural Transport in India, Mittal Publications, 1993.

3. R. Lamm, A. Beck, and T. Ruscher, How to Make Two-Lane Rural Roads Safer, WIT Press, 2007.

4. L. Odier, Low Cost Roads: Design, Construction and Maintenance, Unesco, Butterworths, 1971.

5. G. R. Chatburn, and J. Wiley and Sons, Highway Engineering, Rural Roads and Pavements, Inc. Publication, 2010.

6. Rural Development Study, World Bank Publications, 1998

7. Geometric Design Standards for Rural (Non-Urban) Highways, IRC: 73-1980.

8. Rural Roads Manual, IRC: SP: 20-2002.

9. Manual on Economic Evaluation of Highway Projects in India, IRC: SP: 30-1993

MTTEM-204A-1　　　　Advanced Railway Engineering

No. of Credits: 3   Sessional: 25 Marks

L T P Total   Theory : 75 Marks

3 0 0　 3   Total : 100 Marks

                                                              Duration of Exam: 3 Hours

Course Objectives:

Study the construction and maintenance of railway tracks and to know about railway track components like sleeper,basalt,superelevation,curves etc.

Course Outcomes:

At the end of the course, students will demonstrate their ability to:

1. Understand about the laying of railway track.

2. Understand the technical terms used in railway engineering.

3. Understand various railway components.

4. Understand stopping and crossings.

Syllabus Contents

UNIT - I

Track and track stresses, Train resistances and hauling power of locomotives ; Railway track components: Important features

UNIT – II

Railway curves, Super elevation, Gradients and grade compensation, Points and crossing and their design approaches.

UNIT – III

Construction and maintenance of railway track, Control of train movements; Signals and interlocking.

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UNIT – IV

Modernization of railways and future trends; Track standards and track rehabilitation.

Reference Books:

1. J.S. Mundrey, *Railway Track Engineering*, Tata McGraw Hill Co. Ltd., 3rd Edition, 2000.

2. M.M. Agarwal, *Railway Track Engineering*, Standard Publishers, 1st Ed. 2005.

3. S. Chandra and Aqarwal, *Railway Engineering*, Oxford University Press, 1st Ed. Feb 2008.

4. A.D. Kerr, *Fundamentals of Railway Track Engineering*, Simmons Boardman Pub Co (December 30, 2003)

MTTEM-204A-2   Strength and Deformation behaviour of soil

No. of Credits: 3   Sessional: 25 Marks

L T P Total   Theory : 75 Marks

3 0 0   3   Total : 100 Marks

                                                                Duration of Exam: 3 Hours

Course Objectives:

To study about the physical and chemical properties of soil and to perform various tests on soil to check its characteristics .

Course Outcomes:

At the end of this course, the students will be able to:

1. Understand about the physical and chemical properties of soil.

2. To perform various tests on soil.

3. Understand bearing capacity and soil behaviour.

4. Understand soil plasticity,stresses and shear strength.

Syllabus Contents

UNIT - I

Introduction: Physico-Chemical aspects, Failure theories, Yield criteria, Elastic and Plastic Analysis of soil, Mohar's diagram; Stresses in Soil: Description of state of stress and strain at a point, stress distribution problems in elastic half pace.

UNIT – II

Boussinessqu, Westergard Mindlin and Kelvin problems. Distribution of contact pressure. Analysis of Elastic settlement. ; Soil Plasticity. ; Shear Strength of Soils

UNIT – III

Experimental determination of shear strength, Types of Tests base on drainage condition and their practical significance, Skempton's and hankel's pore water pressure, Coefficients, Stress Path, Shear strength of unsaturated soil, Row's stress dilatancy theory.

UNIT – IV

Constitutive Models: Constitutive Models in Soil Mechanics: Isotropic Elastic, Anisotropic Plasticity and Viscous Models. Representing Soil Behavior using these Models. ; Advances in Constitutive models.

Reference Books:

1. A.P.S. Selvadurai, *Plasticity & Geomechanics*, Cambridge University Press, 2002
2. W.F. Chen, *Limit Analysis & Soil Plasticity*, Elsevier Scientific, 1975.
3. C. S. Desai and J. T. Christian, *Numerical Methods in Geotechnical Engineering*, McGrew Hill, New York.
4. R. F. Scott, *Principles of Soil Mechanics*, Addison & Wesley.

MTTEM-204A-3   Tunnel Engineering

No. of Credits: 3   Sessional: 25 Marks

L T P Total   Theory : 75 Marks

3 0 0   3   Total : 100 Marks

                                                 Duration of Exam: 3 Hours

Course Objectives:

Study concept of design of tunnels,design of pavements,construction ,repair and maintenance of tunnels , ventilation ,lightning ,dust control and drainage.

Course Outcomes:

At the end of the course, students will demonstrate their ability to:

1. Understand the design of tunnels.

2. Apply artificial intelligence in ventilasion and drainage system in tunnels.

3. Understand construction,repair and maintenance.

4. Understand types and components of tunnels, alignment and safety in tunnels.

Syllabus Contents

  UNIT - I

  Tunnels: Necessity/advantage of a tunnel, Classification of Tunnels, Size and shape of a tunnel, Alignment of a Tunnel

  UNIT – II

  Portals and Shafts, Methods of Tunneling in Hard Rock and Soft ground, Mucking, Construction & Excavation methods , soft ground tunnels , Rock tunnels

  UNIT – III

  Lighting and Ventilation in tunnel, Dust control, Drainage of tunnels, Safety in tunnel construction

UNIT – IV

Micro tunneling techniques , Tunnel support design, Ventilation of tunnels , tunnel utilities , safety aspects

Reference Books:

1. Satish Chandra and M.M. Agrawal, Railway Engineering, Oxford University Press, New Delhi

2. S.C. Saxena and S. P. Arora, A Text Book of Railway Engineering, Dhanpat Rai & Sons, New Delhi

3. S.C. Rangwala, K.S. Rangwala and P.S. Rangwala, Principles of Railway Engineering, Charotar

Publishing House, Anand.

4. S.P. Bindra, Principles and Practice of Bridge Engineering, Dhanpat Rai & Sons, New Delhi

5. S.C. Saxena, Tunnel Engineering, Dhanpat Rai & Sons, New Delhi

6. D.J. Victor, Essential of Bridge Engineering, Oxford & IBH Pub. Co. Ltd. Mumbai

MTTEM-205 A   Traffic & Transportation Engg Lab

No. of Credits: 2	Sessional: 30 Marks
L T P Total	Theory : 70 Marks
0 0 4 4	Total : 100 Marks

Course Objectives:

To impart knowledge about the traffic volume study ,accident and parking studies and road safety audit.

Course Outcomes:

At the end of the course, students will demonstrate their ability to:

1. Understand analyse the traffic volume

2. Understand analyse and design the parking area

Syllabus Contents:

- Traffic volume studies
- Spot speed studies
- Accident and Parking studies
- Design of Traffic rotaries and Intersections
- Traffic simulation modeling
- Road safety audit
  Use of software for geometric design and alignment of highway

MTTEM-206A   Transportation Engg Design practice Lab

No. of Credits: 2   Sessional: 30 Marks

L T P Total   Theory : 70 Marks

0 0 4   4   Total : 100 Marks

Course Objectives:

To impart knowledge about the characteristics of bitumen,mix design,design of sub base material,modified marshall test for bituminous mixes.

Course Outcomes:

At the end of the course, students will demonstrate their ability to:

1. Perform the tests conducted on soil,cement and aggregates

2.Analyse the characteristics of bituminous and aggregates

Syllabus Contents:

- Soil-Cement / Soil-lime Mix Design
- Blending of aggregates
- Design and blending of sub-base material
- Characterization of Aggregate and Bituminous materials
- Viscoelastic Characteristics of bituminous and modified binders
- Modified Marshall test for bituminous mixes
- Repeated Load Testing of pavement materials

    Use of software's for Pavement Analysis and Design

MTTEM-207A   Mini-project

No. of Credits: 2   Sessional: 30 Marks

L T P Total   Theory : 70 Marks

0 0 4   4   Total : 100 Marks

Course Outcomes:

At the end of the course:

1. Identify transportation engineering problems reviewing available literature.

2. Study different techniques used to analyze complex pavement systems.

3. Work on the solutions given and present solution by using his/her technique applying engineering principles

Syllabus Contents:

Mini Project will have mid semester presentation and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available.

End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions highlighting individuals' contribution.

Continuous assessment ofMini Project at Mid Sem and End Sem will be monitored by the departmental committee.

Semester –III

MTTEM-301A-1   Traffic Engg & Traffic Flow Theory

No. of Credits: 3   Sessional: 25 Marks

L T P Total   Theory : 75 Marks

3 0 0   3   Total : 100 Marks

                                                                   Duration of Exam: 3 Hours

Course Objectives:

To study essential concepts of traffic sign and signals, road marking ,and other traffic control aids. To understand the design of roads according to the geometric dimensions.

Course Outcomes:

At the end of the course, students will demonstrate their ability to:

1. Understand the traffic signs, signals, road marking and other traffic control aids.
2. Understand all the technical terms used in the construction of roads.
3. Understand the roads according to the geometric dimensions
4. Understand traffic safety measures.

Syllabus Contents

UNIT - I

Traffic surveys: Speed, volume, delay, origin and destination, parking

UNIT – II

Traffic controls:Traffic signs, signals, road marking and other traffic control aids; Traffic safety: Accidents, causes and Prevention

UNIT – III

traffic flow theory: Light hill and Witham's Theory the queuing theory and its application to traffic engineering problems

YMCA UNIVERSITY OF SCIENCE AND TECHNOLOGY, FARIDABAD

UNIT – IV

car flow theory; Simulations of traffic: scanning technique.

Reference Books:

1. L.R. Kadiyalli, *Traffic Engineering and Transport Planning*, Khanna Publishers, 7th Edition, 2008.
2. C.A.O'Flaherty, *Transport Planning and Traffic Engineering*, Arnold, 1997.
3. R. P. Roess, E. S. Prassas, & W.R. Mc Shane, *Traffic Engineering*, Prentice Hall, 3rd Edition, 2004
4. May, *Traffic Flow Fundamentals*, Prentice Hall, 1989
5. F. L. Mannering, *Principles of Highway Engineering and Traffic Analysis*, 4th Edition, 2008, John Wiley.

MTTEM-301A-2　　　Transportation and Environment

No. of Credits: 3	Sessional: 25 Marks
L T P Total	Theory : 75 Marks
3 0 0　3	Total : 100 Marks
	Duration of Exam: 3 Hours

Course Objectives:

To understand the transport related pollution and to maintain the environment and to know about environmental impact assessment

Course Outcomes:

At the end of the course, students will demonstrate their ability to:

1. Understand transport related pollution and to maintain the environment.

2. Understand environmental impact assessment.

3. Understand vehicle characteristics,driver,road and environment.

4. Understand urban and non urban traffic noise sources.

Syllabus Contents

UNIT - I

The Road Environment: human factors in road user behavior, vehicle characteristics, driver, road and environment.

UNIT – II

Environmental Factors: impacts and mitigation measures of air quality, noise, severance, visual intrusion, impact on water quality, use of limited resources, impact on flora & fauna, vibration, dust ; ; Transport related pollution

UNIT – III

Technology Vision-2020; Urban and non urban traffic noise sources, Noise pollution; Energy related aspects of different transport technologies. Traffic calming, Measures, Road transport related air pollution, sources of air pollution, effects of weather conditions

UNIT – IV

Vehicular emission parameters, pollution standards, measurement and analysis of vehicular emission; Imitative measures; EIA requirements of Highways projects, Procedure; MOEF World Bank/EC/UK guidelines ; EIA practices in India.

Reference Books:

1. K. Wark, C.F. Warner, & W.T. Davis, *Air Pollution: Its Origin and Control*, Prentice
Hall. 3rd Ed. 1997.
2. R.W. Boubel, *Fundamentals of Air Pollution*, Academic Press, 4th Ed. 2007.
3. D. Vallero, *Fundamentals of Air Pollution*, Academic Press, 4th Ed. 2007.
4. L. Canter, *Environmental Impact Assessment*, McGraw-Hill International, 2nd Ed. 1995.

MTTEM-302A   Dissertation Phase-I

No. of Credits: 10   Sessional: 60 Marks

L T P Total   Theory : 140 Marks

0 0 20   20   Total : 200 Marks

Course Outcomes:

At the end of the course:

1. Students will learn to survey the relevant literature such as books, national/international refereed journals and contact resource persons for the selected topic of research.

2. Students will be able to use different experimental techniques.

3. Students will be able to use different software/ computational/analytical tools.

4. Students will be able to design and develop an experimental set up/ equipment/test rig.

5. Students will be able to conduct tests on existing set ups/equipments and draw logical conclusions from the results after analyzing them.

6. Students will be able to either work in a research environment or in an industrial environment.

Syllabus Contents:

Every student will carry out dissertation under the supervision of a Supervisor(s). The topic shall be approved by a Committee constituted by the Head of the concerned Deptt. Every student will be required to present two seminar talks, first at the beginning of the Dissertation (Phase-I) to present the scope of the work and to finalize the topic, and second towards the end of the semester, presenting the work carried out by him/her in the semester. The committee constituted will screen both the presentations and work.

Semester –IV

MTTEM-401A   Dissertation Phase- II

No. of Credits: 16   Sessional: 180 Marks

L T P   Total   Theory : 420 Marks

0 0 32   32   Total : 600 Marks

Course Outcomes:

At the end of the course:

1. Students will develop attitude of lifelong learning and will develop interpersonal skills to deal with people working in diversified field will.

2. Students will learn to write technical reports and research papers to publish at national and international level.

3. Students will develop strong communication skills to defend their work in front of technically qualified audience.

Syllabus Contents:

The Dissertation Phase-1 will be continued as dissertation in 4th Semester. The award of sessional will be done by an internal Committee constituted by the Head of the Deptt. This assessment shall be based on presentation (s), report, etc. before this committee. At the end of the semester, every student will be required to submit three bound copies of his/her Master's dissertation of the office of the concerned Department. Out of these, one copy will be kept for department record & one copy shall be for the supervisor.

A copy of the dissertation will be sent to the external examiner by mail by the concerned department, after his/her appointment and intimation from the university. Dissertation will be evaluated by a committee of examiners consisting of the Head of the Department, dissertation supervisor(s) and one external examiner. There shall be no requirement of a separate evaluation report on the Master Dissertation from the external examiner. The external examiner shall be appointed by the University

from a panel of examiners . In case the external examiner so appointed by the University does not turn up, the Director/ Principal of the concerned college, on the recommendation of the concerned Head of the Deptt. Shall be authorized, on behalf of the University., to appointed an external examiner from some other institution.

OPEN ELECTIVES

OEC-101A Business Analytics

No. of Credits: 3	Sessional: 25 Marks
L T P Total	Theory : 75 Marks
3 0 0 3	Total : 100 Marks
	Duration of Exam: 3 Hours

Course outcomes

1. Students will demonstrate knowledge of data analytics.

2. Students will demonstrate the ability of think critically in making decisions based on data and deep analytics.

3. Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making.

4. Students will demonstrate the ability to translate data into clear, actionable insights.

Course objective

1. Understand the role of business analytics within an organization.

2. Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.

3. To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making.

4. To become familiar with processes needed to develop, report, and analyze business data.

5. Use decision-making tools/Operations research techniques.

6. Mange business process using analytical and management tools.

7. Analyze and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc.

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SCHEME & SYLLABUS OF M.TECH – TRANSPORTATION ENGINEERING AND MANAGEMENT

Unit 1: Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics. Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.

Unit 2: Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.

Unit 3: Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.

Unit 4: Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models. Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.

Unit 5:

Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making.

Unit 6: Recent Trends in: Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.

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Reference Books::

1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.

2. Business Analytics by James Evans, persons Education.

OEC-102A   Industrial Safety

No. of Credits: 3   Sessional: 25 Marks

L T P Total   Theory : 75 Marks

3 0 0   3   Total : 100 Marks

                                                      Duration of Exam: 3 Hours

Course Contents:

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.

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.

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.

Unit-IV: Fault tracing: Fault tracing-concept and importance, decision treeconcept, 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.

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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 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

Reference Books::

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.
3. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

OEC-103A   Operations Research

No. of Credits: 3   Sessional: 25 Marks

L T P Total   Theory : 75 Marks

3 0 0   3   Total : 100 Marks

                                              Duration of Exam: 3 Hours

Course Outcomes:

At the end of the course, the student should be able to

1. Students should able to apply the dynamic programming to solve problems of discreet and continuous variables.

2. Students should able to apply the concept of non-linear programming

3. Students should able to carry out sensitivity analysis

4. Student should able to model the real world problem and simulate it.

Syllabus Contents:

Unit 1: Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models.

Unit 2 Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming.

Unit 3: Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT.

Unit 4: Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

Unit 5: Competitive Models,Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation

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Reference Books::

1. H.A. Taha, Operations Research, An Introduction, PHI, 2008

2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.

3. J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008

4. Hitler Libermann Operations Research: McGraw Hill Pub. 2009

5. Pannerselvam, Operations Research: Prentice Hall of India 2010

6. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010

OEC-104A   Cost Management of Engineering Projects

No. of Credits: 3   Sessional: 25 Marks

L T P Total   Theory : 75 Marks

3 0 0   3   Total : 100 Marks

                                                                  Duration of Exam: 3 Hours

Course contents:

Unit 1: Introduction and Overview of the Strategic Cost Management Process, 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 2: Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and nontechnical activities. Detailed Engineering activities. 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. Project commissioning: mechanical and process.

Unit 3: Cost Behavior and Profit Planning Marginal Costing; 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.

Unit 4: Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis. Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.

YMCA UNIVERSITY OF SCIENCE AND TECHNOLOGY, FARIDABAD

SCHEME & SYLLABUS OF M.TECH – TRANSPORTATION ENGINEERING AND MANAGEMENT

Unit 5: Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

Reference Books::

1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi
2. Charles T. Horngren and George Foster, Advanced Management Accounting
3. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting
4. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher
5. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.

OEC-105A   Composite Materials

No. of Credits: 3   Sessional: 25 Marks

L T P Total   Theory : 75 Marks

3 0 0   3   Total : 100 Marks

                                                        Duration of Exam: 3 Hours

Course Contents:

UNIT–I: Introduction: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

UNIT – II: Reinforcements: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

UNIT – III: Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

UNIT–IV: Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method- Compression moulding – Reaction injection moulding. Properties and applications.

UNIT – V: Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

Text Books:

1. Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany.

2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.

Reference Books::

1. Hand Book of Composite Materials-ed-Lubin.

2. Composite Materials – K.K.Chawla.

3. Composite Materials Science and Applications – Deborah D.L. Chung.

4. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tasi.

OEC-106A Waste to Energy

No. of Credits: 3
L T P Total
3 0 0   3

Sessional: 25 Marks
Theory : 75 Marks
Total : 100 Marks
Duration of Exam: 3 Hours

Course outcomes:

Unit-I: Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors.

Unit-II: Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

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.

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.

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.

Reference 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.

3. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.

4. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.

SCHEME & SYLLABUS OF M.TECH – TRANSPORTATION ENGINEERING AND MANAGEMENT

Audit Courses

AUD-01A   English for Research Paper Writing

Course objectives:

Students will be able to:

1. Understand that how to improve your writing skills and level of readability

2. Learn about what to write in each section

3. Understand the skills needed when writing a Title

Note: Ensure the good quality of paper at very first-time submission

Course Contents:

Unit 1: Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness.

Unit 2: Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction.

Unit 3: Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

Unit 4: Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature.

Unit 5: Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions.

Unit 6: useful phrases, how to ensure paper is as good as it could possibly be the first- time submission.

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Suggested Studies:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)

2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press

3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book .

4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

AUD-02A   Disaster Management

Course Objectives: -Students will be able to:

1. learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.

2. critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.

3. develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.

4. critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in.

Unit 1: Introduction: Disaster: Definition, Factors and Significance; Difference between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

Unit 2: Repercussions of Disasters and Hazards: Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.

Unit 3: Disaster Prone Areas in India: Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post-Disaster Diseases and Epidemics.

Unit 4: Disaster Preparedness and Management: Preparedness: Monitoring of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data From Meteorological and other Agencies, Media Reports: Governmental and Community Preparedness.

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Unit 5: Risk Assessment: Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival.

Unit 6: Disaster Mitigation: Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends in Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.

Suggested Readings:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company.

2. Sahni, Pardeep Et.Al. (Eds.)," Disaster Mitigation Experiences and Reflections", Prentice Hall Of India, New Delhi.

3. Goel S. L., Disaster Administration And Management Text And Case Studies", Deep &Deep Publication Pvt. Ltd., New Delhi.

AUD-03A   Sanskrit for Technical Knowledge

Course Objectives

1. To get a working knowledge in illustrious Sanskrit, the scientific language in the world.

2. Learning of Sanskrit to improve brain functioning.

3. Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power.

4. The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature.

Course Contents:

Unit 1: Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences.

Unit 2: Order, Introduction of roots, Technical information about Sanskrit Literature.

Unit 3: Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

Suggested reading

1. "Abhyaspustakam" – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi

2. "Teach Yourself Sanskrit" Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication

3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

Course Output:

Students will be able to

1. Understanding basic Sanskrit language.

2. Ancient Sanskrit literature about science & technology can be understood.

3. Being a logical language will help to develop logic in students.

AUD-04A   Value Education

Course Objectives

Students will be able to

1. Understand value of education and self- development.

2. Imbibe good values in students.

3. Let the should know about the importance of character

Course Contents:

Unit 1: Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation. Standards and principles. Value judgements.

Unit 2: Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature, Discipline.

Unit 3: Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline. Punctuality, Love and Kindness. Avoid fault Thinking. Free from anger, Dignity of labour. Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature.

Unit 4: Character and Competence –Holy books vs Blind faith. Self-management and Good health. Science of reincarnation. Equality, Nonviolence, Humility, Role of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively.

Suggested reading

1 Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi.

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Course outcomes

Students will be able to

1. Knowledge of self-development

2. Learn the importance of Human values

3. Developing the overall personality

AUD-05A   Constitution of India

Course Objectives:

Students will be able to:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.

2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.

3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Unit 1: History of Making of the Indian Constitution: History, Drafting Committee, (Composition & Working).

Unit 2: Philosophy of the Indian Constitution: Preamble, Salient Features.

Unit 3: Contours of Constitutional Rights & Duties: Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

Unit 4: Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.

Unit 5: Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy (Different

departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

Unit 6: Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

Suggested reading

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Course Outcomes:

Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.

2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.

3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.

AUD-06A   Pedagogy Studies

Course Objectives:

Students will be able to:

1. Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
2. Identify critical evidence gaps to guide the development.

Course Contents:

Unit 1: Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology, Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions**.** Overview of methodology and Searching.

Unit 2: Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

Unit 3: Evidence on the effectiveness of pedagogical practices. Methodology for the in depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.

Unit 4: Professional development: alignment with classroom practices and follow-up support, Peer support. Support from the head teacher and the community. Curriculum and assessment. Barriers to learning: limited resources and large class sizes.

Unit 5: Research gaps and future directions: Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.

Suggested reading

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.

2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.

3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.

4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.

5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.

6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.

7. www.pratham.org/images/resource%20working%20paper%202.pdf.

Course Outcomes:

Students will be able to understand:

1. What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?

2. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?

3. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

AUD-07A   Stress Management by Yoga

Course Objectives

1. To achieve overall health of body and mind

2. To overcome stress

Course Contents:

Unit 1: Definitions of Eight parts of yog. (Ashtanga)

Unit 2 Yam and Niyam. Do`s and Don't's in life i) Ahinsa, satya, astheya, bramhacharya and aparigraha ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

Unit 3: Asan and Pranayam i) Various yog poses and their benefits for mind & body ii)Regularization of breathing techniques and its effects- Types of pranayama.

Suggested reading

1. 'Yogic Asanas for Group Tarining-Part-I" : Janardan Swami Yogabhyasi Mandal, Nagpur

2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

Course Outcomes:

Students will be able to:

1. Develop healthy mind in a healthy body thus improving social health also.

2. Improve efficiency

AUD-08A   Personality Development through Life Enlightenment Skills

Course Objectives

1. To learn to achieve the highest goal happily

2. To become a person with stable mind, pleasing personality and determination

3. To awaken wisdom in students

Course contents

Unit 1: Neetisatakam-Holistic development of personality

Verses- 19,20,21,22 (wisdom)

Verses- 29,31,32 (pride & heroism)

Verses- 26,28,63,65 (virtue)

Verses- 52,53,59 (dont's)

Verses- 71,73,75,78 (do's)

Unit 2: Approach to day to day work and duties.

Shrimad Bhagwad Geeta : Chapter 2-Verses 41, 47,48,

Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17,23, 35,

Chapter 18-Verses 45, 46, 48.

Unit 3: Statements of basic knowledge.

Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68

Chapter 12 -Verses 13, 14, 15, 16,17, 18

Personality of Role model. Shrimad Bhagwad Geeta:

Chapter2-Verses 17, Chapter 3-Verses 36,37,42,

Chapter 4-Verses 18, 38,39

Chapter18 – Verses 37,38,63

Suggested reading

1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata.

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2.   Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath,Rashtriya Sanskrit
Sansthanam, New Delhi.

Course Outcomes

Students will be able to

1. Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life.

2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity

3. Study of Neetishatakam will help in developing versatile personality of students.