West Bengal State Council of Technical & Vocational Education and Skill Development

TEACHING AND EXAMINATION SCHEME FOR DIPLOMA COURSES

COURSE NAME: RENEWABLE ENERGY ENGINEERING

COURSE CODE : REE

DURATION OF COURSE : 6 SEMESTERS

SEMESTER - IV

Sl. No.	Course Code	Course Title	Hours Per Week			Total Contact Hours /Week	Credit	MARKS	
			L	T	P			IA	ESE
1.	REEPC202	Solar Photovoltaic - II	3	0	0	3	3	40	60
2.	REEPC204	Solar Photovoltaic – II Laboratory	0	0	2	2	1	60	40
3.	REEPC206	Wind Energy	3	0	0	3	3	40	60
4.	REEPC208	Wind Energy Laboratory	0	0	3	3	1.5	60	40
5.	REEPC2010	Bio-Energy	3	0	0	3	3	40	60
6.	REEPC2012	Bio-Energy Laboratory	0	0	3	3	1.5	60	40
7.	REEPE202	Elective –I (Any one from Program Elective list)	3	0	0	3	3	40	60
8.	REEPE204	Elective –II (Any one from Program Elective list)	3	0	0	3	3	40	60
9.	PR202	Minor Project	0	0	4	4	2	60	40
10.	AU202	Essence of Indian Knowledge & Tradition	2	0	0	2	0	---	---
		Total	**17**	**0**	**12**	**29**	**21**	**440**	**460**

L- Lecture, T-Tutorial, P-Practical, IA-Internal Assessment , ESE-End Semester Exam

Total Marks : 900

The student has to obtain 40% marks individually both in Internal Assessment and End Semester Examination to pass.

Semester : Fourth	
Course Code : REEPC202	
Course Title : Solar Photovoltaic - II	
Number of Credit: 3 (L- 3; T- 0; P- 0)	
Prerequisite: Nil	
Course Category: PC	
Course Objectives: 1. To know the PV system components and their functions. 2. To generate electricity from solar PV system. 3. To learn different types of PV systems and their specific applications. 4. To understand the concept of smart grid and apply it in renewable energy power plant.	
Course Contents (Theory):	
Unit : 1	**1. Solar Photovoltaic Systems:** 1.1 Components of PV Systems. 1.2 Maximum power condition of PV system. 1.3 Formation of PV Panel, Cell, Module, Array. 1.4 Balance Of System (BOS). 1.5 Mounting structures and installation of PV system. 1.6 Solar tracking systems. 1.7 Power conditioning and control of PV system – Inverters, DC-DC Converters. 1.8 Operations of Charge controllers – ON/OFF type, PWM type, MPPT type. 1.9 Battery Storage systems – Lead Acid, Nickel Cadmium, Li-ion, Zinc Manganese dioxide.
Unit : 2	**2. Classification of PV system:** 2.1 Stand-Alone Solar PV System. 2.2 Grid Interactive Solar PV System. 2.3 Hybrid Solar PV System. 2.4 Centralized and De-Centralized Systems.
Unit : 3	**3. Evolution on Electric Grid:** 3.1 Concept of Smart Grid. 3.1.1 Definition of Smart Grid. 3.1.2 Need of Smart Grid.

	3.1.3 Functions Smart Grid. 3.1.4 Opportunities and barriers of Smart Grid. 3.2 Difference between Conventional Grid and Smart Grid. 3.3 Concept of Resilient Grid and Smart Grid. 3.4 Role of Smart Meter in Smart Grid.
Unit : 4	**4. Real Time Prising:** 4.1 Smart Appliances. 4.2 Automatic Meter Reading (AMR). 4.3 Smart Sensors. 4.4 Smart Grid Life Cycle, Regulatory & Cost Recovery, Strategy & Planning. 4.5 Technology Integration. 4.6 Business process readiness, Compliance & Risk Management.
Unit : 5	**5. Solar PV Applications:** 5.1 Grid Interactive Solar PV Power Generation, 5.2 Principles & components of Solar Water Pumping system, 5.3 Principles & components of street Lighting, 5.4 Principles & components of Medical Refrigeration, 5.5 Village Power using solar PV system, 5.6 Telecommunication and signaling using PV system, 5.7 Numerical based on Water Pumping & Street lighting using PV system.

Text / Reference Books:

Sl. No.	Titles of Book	Name of Author	Name of Publisher
1.	Non-Conventional Energy Resources	B. H. Khan	The McGraw Hill Publications.
2.	Non-Conventional Energy Sources	G.D. Rai	Khanna Publications
3.	Solar Energy – Principles of Thermal Collection and Storage	S. P. Sukhatme and J.K. Nayak	Tata McGraw-Hill, New Delhi
4.	Solar Energy, Fundamentals and Applications	Garg, Prakash	Tata McGraw Hill.
5.	Non-Conventional Energy Resources	ShobhNath Singh	Pearson
6.	Non-Conventional Energy Resources	S.H.Saeed, D.K.Sharma	S.K.Kataria & Sons

Course Outcomes:

After completing the course the student will be able to:

1. Know about the components of solar PV Systems & control action of PV system.
2. Generate electricity from solar PV system after assembling PV system components.
3. Apply smart power grid system concept for solar power distribution.
4. To learn different types of solar PV systems and their applications.
5. Interpret applications of solar PV system in various fields.

END SEMESTER EXAMINATION SCHEME (Solar Photovoltaic - II) – 60 Marks									
GROUP	**UNIT**	**OBJECTIVE QUESTIONS (20) (One/Two Sentences, MCQ)**				**SUBJECTIVE QUESTIONS (40)**			
		TO BE SET	**TO BE ANSWERED**	**MARKS PER QUESTION**	**TOTAL MARKS**	**TO BE SET**	**TO BE ANSWERED**	**MARKS PER QUESTION**	**TOTAL MARKS**
A	1,2,3	11	20	1	1 X 20 =20	5	5 (Taking at least two from each group)	8	8 X 5 = 40
B	4,5	11				4			
Note: Paper-setter should take into account of each unit and set the paper accordingly so that all units get equal importance.									

Semester : Fourth
Course Code : REEPC204
Course Title : Solar Photovoltaic – II Laboratory
Number of Credit: 1 (L- 0; T- 0; P- 2)
Prerequisite: Nil
Course Category: PC

Course Objectives:

1. To know the PV system components and their functions.
2. To generate electricity from solar PV system.
3. To learn different types of PV systems and their specific applications.
4. To understand the concept of smart grid and apply it in renewable energy power plant.

List of Practicals: (At least Eight experiments are to be performed)

1. Troubleshoot solar PV MPPT system and identify its remedy.
2. Troubleshoot solar PV panel and arrays and identify its remedy.
3. Study of different components of a solar inverter system and its troubleshooting.
4. Performance analysis of single phase bridge inverter for R-L load and voltage control by single pulse width modulation.
5. Study of solar smart metering system and its troubleshooting.
6. Experiment to run water pumping system using solar power.
7. Identify different components of solar street lighting system for DC supply.
8. Identify different components of solar street lighting system for AC supply.
9. Design each component of a solar PV street lighting system with AC supply.
10. Assemble the components of solar home lighting system & study the system.
11. Calculate power flow of a stand-alone PV system with DC load and battery.
12. Calculate power flow of a stand-alone PV system with AC load and battery.
13. Identify and Troubleshoot solar signal conditioners.
14. Troubleshoot solar off-grid systems.

Course Outcomes:

After completing the course the student will be able to:

1. Know about the components of solar PV Systems& control action of PV system.
2. Generate electricity from solar PV system after assembling PV system components.
3. Apply smart power grid system concept in solar power distribution.
4. To learn different types of solar PV systems and their applications.
5. Interpret applications of solar PV system in various fields.

EXAMINATION SCHEME (Solar Photovoltaic – II Laboratory) – 100 Marks
1. Internal Assessment (60 Marks): Evaluation is based on – **Work done-30, Quality of report & Presentation-15, Performance in Viva-voce-15.**
2. End Semester Examination (40 Marks): Evaluation is based on – **Work done -15, Quality of report & Presentation-15, Performance in Viva-voce-10.**

Semester : Fourth	
Course Code : REEPC206	
Course Title : Wind Energy	
Number of Credit: 3 (L- 3; T- 0; P- 0)	
Prerequisite: Nil	
Course Category: PC	
Course Objectives: 1. To learn the nature of different types wind for wind energy conversion. 2. To know the component details& features of a wind turbine required for a wind mill. 3. To learn wind power conversion technology and the economics relatingto it. 4. To generate electricity from a wind mill. 5. To interpret the troubleshooting of a wind turbine.	
Course Contents (Theory):	
Unit : 1	**1. Basics & Meteorology of Wind:** 1.1 Wind resources, Wind energy scenario in India. 1.2 Types of Winds – Planetary or Permanent Winds, Trade Winds, Westerlies Winds, Polar Winds, Periodic Winds, Sea Breeze Winds, Land Breeze Winds.

	1.3 Monsoon Winds: Summer, Winter. 1.4 Local & Regional Wind System. 1.5 Factors influencing Wind. 1.6 Pressure Gradient Force, Coriolis Force. 1.7 Power in the Wind, Power vs. Wind speed characteristics. 1.8 Guidelines for Wind turbine site selection.
Unit : 2	**2. Wind Turbine:** 2.1 Parts of wind turbine – Nacelle, Rotor blades, Blade count, Blade materials, Hub, Low speed shaft, Gearbox, High speed shaft, Electrical generator, Yaw mechanism, Electronic controller, Hydraulics system, Cooling unit, Tower, Anemometer, Wind wane. 2.2 Classification of Wind Turbine: 2.2.1 Types, Drag force, Lift force. 2.2.2 Vertical axis Wind Turbine (VAWT) – Types, Constructional details, Operating principle, Advantage & Disadvantages of VAWT. 2.2.3 Horizontal axis Wind Turbine (HAWT) – Types, Constructional details, Operating principle, Advantage & Disadvantages of HAWT. 2.2.4 Direct drive Wind Turbine – Constructional details, Operating principle, Advantage & Disadvantages. 2.2.5 Geared drive Wind Turbine – Constructional details, Operating principle, Advantage & Disadvantages.
Unit : 3	**3. Wind Energy Conversion:** 3.1 Principles of Wind Energy Conversion, 3.1.1 Lift force, Drag force, Pitch angle, Angle of attack, 3.1.2 Theory of energy extraction from Wind, 3.1.3 Wind turbine theory, Condition for maximum performance coefficient. 3.2 Characteristics of Windmill rotor – 3.2.1 Pitch, Tip Speed Ratio (TSR), Number of rotor blade, Solidity. 3.2.2 Rotor Torque equation, Co-efficient of Performance, Power co-efficient, Maximum torque. (Numerical) 3.2.3 Torque – TSR characteristics. 3.3 Working principle of generators used with wind turbine – 3.3.1 Induction generator (IG). 3.3.2 Permanent magnet alternators. 3.3.3 Synchronous generators. 3.3.4 DC generators.
Unit : 4	**4. Wind Power Generation & Hybrid Systems:** 4.1 Fixed Speed Drive Scheme. 4.2 Variable Speed Drive Scheme. 4.3 load control. 4.4 Hybrid System Models.

	4.4.1 Wind–Diesel Hybrid System. 4.4.2 Wind– Photovoltaic Hybrid System. 4.4.3 Battery Banks and Power Converters. 4.5 Cost components of wind power project, Fixed cost and variable costs. 4.6 Failure Analysis, Ageing and Rehabilitation: 4.6.1 Effective Operation of Wind Farm. 4.6.2 Central Monitoring System. 4.6.3 Modern Developments & SCADA. 4.6.4 Estimation of Energy Production, Capacity Factor, Capacity Credit. 4.6.5 Off shore Wind farm Development. 4.6.6 Operation & Supervision of Wind Farm.
Unit : 5	**5. Economics of Wind Energy & Environmental Impact:** 5.1 Economics of Wind Energy: 5.1.1 Cost of energy, Return on Investment (ROI). 5.1.2 Life time cash flow and Internal rate of Return (IRR). 5.1.3 National & International Wind Energy Market. 5.2 Environmental Impact and safety Aspects: 5.2.1 Environmental Impact. 5.2.2 Aviation interaction. 5.2.3 Visual impact. 5.2.4 Noise, Radio waves interference. 5.2.5 Bird life, Land use, Impact on flora & fauna.
Unit : 6	**6. Installation & Maintenance of Wind Turbine:** 6.1 Installation steps of small wind turbine. 6.2 Maintenance of different parts of wind turbine. 6.3 Common electrical faults in wind turbine.

Text / Reference Books:

Sl. No.	Titles of Book	Name of Author	Name of Publisher
1.	Non-Conventional Energy Resources	B.H Khan	McGraw-Hill
2.	Non-Conventional Energy Sources	G. D. Rai	Khanna Publishers
3.	Wind Energy System	Gary L. Johnson	Printice Hall Inc, New Jersy
4.	Power Plant Technology	E. I. Walil	McGraw Hill Publishers, New York
5.	Handbook of Wind Energy	T. Burton	John Wiley and Sons
6.	Wind Electrical Systems	S.N. Bhadra, D.	Oxford Univ. Press

		Kasthaand S. Banerjee	
7.	Non-Conventional Energy Resources	ShobhNath Singh	Pearson
8.	Non-Conventional Energy Resources	S.H.Saeed, D.K.Sharma	S.K.Kataria& Sons
9.	Power Plant Engineering, 3rd Edition,	P K. Nag	Tata McGraw Hill, 2008.
10.	Wind Energy Technology	John F. Walker and Nicholas Jenkins	John Wiley, 1997

Course Outcomes:

After completing the course the student will be able to:

1. Know about the components of a wind turbine and their functions.
2. Know the principle & components of wind energy conversion system.
3. Know different hybrid models associated with wind energy.
4. Generate electricity from a SWT system & measure the machine parameters.
5. Know the economics relating to wind power generation.
6. Interpret faults in a wind turbine and its remedy.

END SEMESTER EXAMINATION SCHEME (Wind Energy) – 60 Marks

GROUP	UNIT	OBJECTIVE QUESTIONS (20) (One/Two Sentences, MCQ)				SUBJECTIVE QUESTIONS (40)			
		TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS
A	1,2,3	11	20	1	1 X 20 =20	5	5 (Taking at least two from each group)	8	8 X 5 = 40
B	4,5,6	11				4			

Note: Paper-setter should take into account of each unit and set the paper accordingly so that all units get equal importance.

Semester : Fourth
Course Code : REEPC208
Course Title : Wind Energy Laboratory
Number of Credit: 1.5 (L- 0; T- 0; P- 3)
Prerequisite: Nil
Course Category: PC
Course Objectives: 1. To learn the nature of different types wind for wind energy conversion. 2. To know the component details & features of a wind turbine required for a wind mill. 3. To learn wind power conversion technology and the economics relating to it. 4. To generate electricity from a wind mill. 5. To interpret the troubleshooting of a wind turbine.
List of Practicals: (At least Eight experiments are to be performed)
1. Identify the specified components of a 1 KW Small Wind Turbine (SWT) system.
2. Set up a 1KW Small Wind Turbine (SWT) system.
3. Experiment to test the performance of Squirrel Cage Induction Generator (SCIG) – measurement of active and reactive power with respect to speed of SCIG and its analysis.
4. Experiment to test the performance of Permanent Magnet Synchronous Generator (PMSG) – a) No load test, b) Load test.
5. Check the performance of Direct Drive SWT.
6. Check the performance of Gear Drive SWT.
7. Assemble and dismantle the SWT system.
8. Simulate faults and its remedy in SWT system.
9. Interpret the wiring of a SWT system and its electrical – electronic control panel.
10. Estimate the generation from a 1kW SWT system and measure the parameters of generation.

Course Outcomes:

After completing the course the student will be able to:

1. Know about the components of a wind turbine and their functions.
2. Know the principle & components ofwind energy conversion system.
3. Know different hybrid models associated with wind energy.
4. Generate electricity from a SWT system & measure the machine parameters.
5. Know the economics relating to wind power generation.
6. Interpret faults in a wind turbine and its remedy.

EXAMINATION SCHEME (Wind Energy Laboratory) – 100 Marks
1. Internal Assessment (60 Marks): Evaluation is based on – **Work done-30, Quality of report & Presentation-15, Performance in Viva-voce-15.**
2. End Semester Examination (40 Marks): Evaluation is based on – **Work done -15, Quality of report & Presentation-15, Performance in Viva-voce-10.**

Semester : Fourth
Course Code : REEPC2010
Course Title : Bio-Energy
Number of Credit: 3 (L- 3; T- 0; P- 0)
Prerequisite: Nil
Course Category: PC
Course Objectives: 1. To learn about biomass resources in our surroundings and conversion of electrical energy

from those resources. 2. To know about bio-gas production technology. 3. To learn how to produce electricity from a biogas plant. 4. To learn socio-economic aspects of Biogas usages.	
Course Contents (Theory):	
Unit : 1	**1. Fundamentals of Bio-Mass:** 1.1 Biomass resources. 1.2 Energy farming. 1.3 Different forms of Biomass, their composition & fuel properties. 1.4 Indian scenario for Biomass resources. 1.5 Bio-Fuel quality assessment studies. 1.6 Advantages of biomass energy.
Unit : 2	**2. Bio mass Conversion Technology Methods**: 2.1 Physical method. 2.2 Incineration. 2.3 Thermo-chemical method. 2.4 Bio-chemical method. 2.5 Urban waste to energy conversion – Municipal solid waste incineration plant, Sewage to energy conversion.
Unit : 3	**3. Bio-Mass Gasification:** 3.1 Theory of Gasification. 3.2 Pre-Treatment methods of Biomass. 3.3 Physical Treatment – Mechanically Grinding & Chipping, Moisture Removing or Adding, Application of Binding Agent, Steaming, Torrefaction. 3.4 Low temperature & High temperature Gasification. 3.5 Chemistry of Gasification & its products.
Unit : 4	**4. Classification of Gasifier:** 4.1 Updraft Gasifier – Principles, Design & Application. 4.2 Downdraft Gasifier – Principles, Design & Application. 4.3 Cross Draft Gasifier – Principles, Design & Applications. 4.4 Open core Gasifier – Principles, Design & Applications. 4.5 Fluidized Bed Gasifier – Principles, Design & Applications. 4.6 Advantages & disadvantages of different gasifiers. 4.7 Gasifier Biomass feed parameters. 4.8 Different Models of Gasifiers.

Unit : 5	**5. Bio-Gas Production:** 5.1 Biogas & its composition. 5.2 Materials used for Biogas generation. 5.3 Anaerobic digestion – Basic process, advantages. 5.4 Constructional details of a Biogas plant. 5.5 Working principle of a Biogas plant. 5.6 Operational parameters of Biogas plant. 5.7 Types of Biogas plant – 5.7.1 Fixed dome type. 5.7.2 Floating type. 5.8 Comparison between the two types, Their advantages & disadvantages. 5.9 Different models of Biogas plant in India – Construction & advantages. 5.10 Constructional details of Digester. 5.11 Design parameters of Digester. 5.12 Benefits of Biogas, Utilization of Biogas. 5.13 Maintenance of Biogas plant. 5.14 Numerical on Biogas plant.
Unit : 6	**6. Commissioning and Management of Bio-Gas Plants:** 6.1 Commissioning and Management of Bio-gas Plant. 6.2 Community Plant. 6.3 Power from producer gas. 6.4 Biogas appliances. 6.5 Effect of Biogas on Engine performance. 6.6 Socio-Economic aspects of Biogas usages. 6.7 Environmental aspects of Bio-Energy conversion. 6.8 Methods of detoxification.

Text / Reference Books:

Sl. No.	Titles of Book	Name of Author	Name of Publisher
1.	Non-Conventional Energy Resources	B. H. Khan	The McGraw Hill Publications.
2.	Non-Conventional Energy Sources	G.D. Rai	Khanna Publications
3.	Non-Conventional Energy Resources	ShobhNath Singh	Pearson
4.	Non-Conventional Energy	S.H.Saeed,	S.K.Kataria& Sons

	Resources	D.K.Sharma	
5.	Understanding Clean Energy and fuels from biomass	Mukunda HS.	Wiley-India Pvt. Ltd, 2011
6.	Hand book of plant based biofuel	Pandey A.	CRC Press, Taylor & Francis, 2008
7.	Biogas Systems, Principle and Applications	Mital KM.	New Age International Ltd. 1996
8.	Biomass, Energy and Environment, A developing country perspective from India.	Ravindranath NH. Hall DO.	Oxford University Press, 1995

Course Outcomes:

After completing the course the student will be able to:

1. Know various sources of biomass, their fuel value & applications in biomass energy conversion.
2. Learn the design parameters and applications of different gasifiers.
3. Know about the components of a bio-gas plant and their functions.
4. Get concept on bio-gas production technology.
5. Produce biogas from a small biogas plant and generate electricity there from.
6. Measure parameters of the biogas plant.
7. Apply biogas in gas engine applications.
8. Interpret the economic aspects of a biogas plant.

END SEMESTER EXAMINATION SCHEME (Bio-Energy) – 60 Marks

GROUP	UNIT	OBJECTIVE QUESTIONS (20) (One/Two Sentences, MCQ)				SUBJECTIVE QUESTIONS (40)			
		TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS
A	1,2,3	11	20	1	1 X 20 =20	5	5 (Taking at least two from each group)	8	8 X 5 = 40
B	4,5,6	11				4			

Note: Paper-setter should take into account of each unit and set the paper accordingly so that all units get equal importance.

Semester : Fourth

Course Code : REEPC2012

Course Title : Bio-Energy Laboratory

Number of Credit: 1.5 (L- 0; T- 0; P- 3)

Prerequisite: Nil

Course Category: PC

Course Objectives:

1. To learn about biomass resources of our surroundings and conversion of electrical energy from those resources.
2. To know about bio-gas production technology.
3. To learn how to produce electricity from a biogas plant.
4. To learn socio-economic aspects of Biogas usages.

List of Practicals: (At least Eight experiments are to be performed)

1. Identify the components of Biogas and measure the quantity in percentage.
2. Set up a one cubic meter Anaerobic Digestion Biogas plant.
3. Measure the calorific value of the Biogas.
4. Measure the yield of the Biogas changing the input parameters e.g. temperature, input raw materials.
5. Set up a gas cleaning system with H2S and H2O filter.
6. Measure the yield of the Biogas after cleaning.
7. Calculate the efficiency of the Biogas plant.
8. Set up a 1kW gas engine for power generation.
9. Measure the efficiency of the gas engine with Biogas input.
10. Generate electricity from a Bio gas plant and use it for lighting load.

Course Outcomes:

After completing the course the student will be able to:

1. Know various sources of biomass, their fuel value &applications in biomass energy conversion.
2. Learn the design parameters and applications of different gasifiers.
3. Know about the components of a bio-gas plant and their functions.
4. Get concept on bio-gas production technology.

5. Produce biogas from a small biogas plant and generate electricity there from.
6. Measure parameters of the biogas plant.
7. Apply biogas in gas engine applications.
8. Interpret the economic aspects of a biogas plant.

EXAMINATION SCHEME (Bio-Energy Laboratory) – 100 Marks
1. Internal Assessment (60 Marks): Evaluation is based on – **Work done-30, Quality of report & Presentation-15, Performance in Viva-voce-15.**
2. End Semester Examination (40 Marks): Evaluation is based on – **Work done -15, Quality of report & Presentation-15, Performance in Viva-voce-10.**

Semester : Fourth
Course Code : REEPE202
Course Title : Elective – I (To be chosen from Program Elective List)
Number of Credit: 3 (L- 3; T- 0; P- 0)
Prerequisite: Nil
Course Category: PE

Semester : Fourth
Course Code : REEPE204
Course Title : Elective – II (To be chosen from Program Elective List)
Number of Credit: 3 (L- 3; T- 0; P- 0)
Prerequisite: Nil
Course Category: PE

Semester : Fourth

Course Code : AU202

Course Title : Essence of Indian Knowledge & Tradition

Number of Credit: 0 (L- 2; T- 0; P- 0)

Prerequisite: Nil

Course Category: AU

Contents (Theory):

Basic Structure of Indian Knowledge System:

(i) वेद, (ii) उऩवेद (आयुवेद, धनुवेद, गन्धवेद, स्थाऩत्य आदद) (iii) वेदथाथांग (शिक्था, कलऩ, ननरुत, व्थाकरण

- **Modern Science and Indian Knowledge System**
- **Yoga and Holistic Health care**
- **Case Studies**

Text / Reference Books:

Sl. No.	Titles of Book	Name of Author	Name of Publisher
1.	Cultural Heritage of In- dia-Course Material	V. Sivaramakrishna	BharatiyaVidyaBhavan, Mumbai, 5th Edition, 2014
2.	Modern Physics and Vedant	Swami Jitatmanand	BharatiyaVidyaBhavan
3.	The wave of Life	Fritzof Capra	
4.	Tao of Physics	Fritzof Capra	
5.	Tarkasangraha of Annam Bhatta, Inernational	V N Jha	Chinmay Foundation, Velliarnad, Amaku,am
6.	Science of Consciousness Psychotherapy and Yoga Practices	RN Jha	VidyanidhiPrakasham, Delhi, 2016

Semester : Fourth
Course Code : PR202
Course Title : Minor Project
Number of Credit: 2 (L- 0; T- 0; P- 4)
Course Category: PR
Course Contents :
Minor Project will be based on real/ live problems of the Industry/Govt./NGO/ MSME/Rural Sector or an innovative idea having the potential of a Startup.

EXAMINATION SCHEME (Minor Project) – 100 Marks
1. Internal Assessment (60 Marks): Evaluation is based on – **Work done-30, Quality of report & Presentation-15, Performance in Viva-voce-15.**
2. End Semester Examination (40 Marks): Evaluation is based on – **Work done -15, Quality of report & Presentation-15, Performance in Viva-voce-10.**

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