MINOR PROGRAMS for AY 2022-23

SN	DEPTT / BoS	TITLE OF PROGRAM	CREDITS	DESCRIPTION Department, Industry, NPTEL	ELIGIBILITY CRITERIA
1	Civil Engineering	BTech Minors Introduction to Civil Engineering	18	Industry Associated [1. Sun Enviro Technologies Pvt. Ltd, Nagpur, 2. NEO Infrastructure Consultants, Nagpur]	Offered to students of ME, EL, EE, ET, IT, CT, CSE
2	Mechanical Engineering	BTech Minors in Integrated Manufacturing And Machine Learning	18	Industry Associated [Parle global Pvt. Ltd. Indore]	Offered to students of CE, EL, EE, ET, IT, CT, CSE
3	Electrical Engineering	BTech. Minors in Electric Vehicles	18	Industry Associated [1. SkyWings Technologies, Pvt. Ltd., Pune 2. TE connectivity, Pvt. Ltd., Bangalore]	Offered to students of CE, ME, EE, ET, IT, CT, CSE
4	Electronics Engineering	BTech. Minors in Internet of Things (IoT)	18	Industry Associated [Adept EmBTechdded Solutions Pvt Ltd., Nagpur]	Offered to students of CE, ME, EL, IT, CT, CSE
5	Electronics & telecom. Engineering	BTech Minors in DSP and Embeded System	18	Industry Associated [First Impression Technologies Pvt. Ltd., Nagpur]	Offered to students of CE, ME, EL, IT, CT, CSE
6	Computer Tech.	BTech Minors in Computer Science & Engineering		Industry Associated [GT Foundation, Pune]	Offered to students of CE, ME, EL, EE, ET
7	Information Tech.	BTech Minor in Cloud Computing and Big Data Analytics	18	Industry Associated [Infocepts, Nagpur]	Offered to students of CE, ME, EL, EE, ET
8	General Engg	BTech. Minor in Corporate Management	18	Associated with DMIMS Nagpur	Offered to students of CE, ME, EL, EE, ET, IT, CT, CSE
		BTech. Minor in German and French languages	18	Industry Associated with Bright Mind Academy Nagpur	Offered to students of CE, ME, EL, EE, ET, IT, CT, CSE
		BTech. Minor in Psychology	18	Associated with PGTD RTMNU & MGI Nagpur	Offered to students of CE, ME, EL, EE, ET, IT, CT, CSE
9	YCCE-DMMC Minor under BoS of ETC engineering.	BTech. Minors in Medical Imaging and Informatics	20	Associated with DMMC (DMIMSDU) Nagpur	Offered to students of EL, EE, ET, IT, CT, CSE

YESHWANTRAO CHAVAN COLLEGE OF ENGINEERING
(An Autonomous Institution affiliated to R T M Nagpur University Nagpur)
Accredited by NAAC (1st Cycle) with 'A' Grade (Score 3.25 on 4 Point Scale)
Wanadongri, Hingna Road, Nagpur-441110

Department of Civil Engineering
(Minor in CE)

B.E. Minor in Civil Engineering
SoE & Syllabus 2022-23

Information Brochure of Minor Program

1. Title of Program: **B.E. Minor in Civil Engineering**
2. Type of Program : **Minor**
3. Department offering the program: **Civil Engineering**
4. Industry Associated:
   1. **Sun Enviro Technologies Pvt. Ltd,**
      Central Excise Layout, Khamla, Nagpur,
      Maharashtra 440025, India
   2. **NEO Infrastructure Consultants,**

5. The students from **EL, ME, EE, ETC, CT, IT, CSE** are eligible to opt for this program. ***Department of Civil Engineering students are not permitted to opt for the program.***

6. General information about courses in program:

The minor is a subject offered by a department to the students other than the parent department. A student can do Majors in chosen filed as per the career goal, and a minor may be chosen to enhance the major thus adding the diversity, breadth and enhanced skills in the field. The minor in civil engineering opens opportunities for students who are interested in gaining knowledge across the university and would like an overview of the principles of civil engineering. The purpose of the Minor in Civil Engineering is to give students with sufficient background in the field of civil engineering.

The Program of Minor in Civil Engineering includes the fundamental subjects like Strength of Materials, Basics of Building Construction, Water Supply and Sanitation, Fundamentals of Transportation Engineering and Civil Engineering Materials. The Strength of Materials subject gives the idea about the behaviour of materials or structures when subjected to various types of forces. The Basics of Building Construction includes the all aspects of construction like Building Planning, Designing and Materials and amenities requirements etc. Water Supply and Sanitation course focus on the aspects like water supply, water quality, treatment and

distribution of water, sewage collection, treatment and disposal. The Fundamentals of Transportation Engineering gives overview of all types of transport system like road, railway, metro, air and water transport.

7. Advance knowledge or research orientation of Program

The Programme is designed to impart knowledge about basic knowledge in the field of civil engineering.

The knowledge gained will be helpful in developing interest and carry out inter disciplinary research

work.

The program will help students to gain knowledge in civil engineering by studying further.

This programme will help students to become successful entrepreneurs as this requires knowledge of

multiple areas. The students can pursue higher studies in fields of their interest and management.

8. Employability potential of program:

While individuals with an associate degree may qualify for some entry-level positions, most civil engineering careers call for at least a bachelor's or master's. For this reason, candidates should expect to earn at least a four-year degree, though advanced positions often call for graduate education. Careers may also mandate licenses, certifications, and/or field experiences. A great place for candidates to start is by researching requirements for their career goals and choosing programs that match those criteria. When deciding on a career path it is very difficult to know whether your chosen industry will continue growing, become oversaturated or even become completely redundant. It is clear that the trend is towards information technology and automation and this is set to remain the case for the foreseeable future. Traditional fields such as civil engineering is still in high demand.

9. Departmental Steering committee:

SN	Name of the Faculty Member	Post	Designation	e-mail ID	Contact Number
1	Dr. V.G. Meshram	Chairman	Associate Professor & Head	hod_ce@ycce.edu	9850340838
2	Dr. S.R. Khandeshwar	Member	Professor	khandeshwar333@yahoo.com	9822578533
3	Dr. S.V. Ambekar	Member	Professor	sv_ambekar@rediffmail.com	9422105597
4	Dr. A.R Gajbhiye	Member	Professor	yccehodcivil@yahoo.in	9850958980

10. Departmental coordinator

SN	Name of the Faculty Member	Post	Designation	e-mail ID	Contact Number
1	Dr. Ms. M.S. Bhagat	Co-Ordinator	Assistant Professor	msbciv2gmail.com	7620494011

Scheme of Examinations

B.E Minors in Introduction to Civil Engineering													
SN	Sem	Sub Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
					L	T	P	Hrs		MSEs*	TA	ESE	
1	V	CVM101	Strength of Materials	**T**	3	0	0	3	3	30	30	40	3
2	V	CVM102	**Lab-** Strength of Materials	**P**	0	0	2	2	1		60	40	
3	VI	CVM111	Basics of Building Construction	**T**	3	0	0	3	3	30	30	40	3
4	VI	CVM112	Water Supply and Sanitation	**T**	3	0	0	3	3	30	30	40	3
5	VI	CVM113	**Lab-** Water Quality Analysis	**P**	0	0	2	2	1		60	40	
6	VII	CVM121	Fundamentals of Transportation Engineering	**T**	3	0	0	3	3	30	30	40	3
7	VII	CVM122	Civil Engineering Materials	**T**	3	0	0	3	3	30	30	40	3
8	VII	CVM123	**Lab-** Civil Engineering Materials	**P**	0	0	2	2	1		60	40	
			TOTAL		**15**	**0**	**6**	**21**	**18**				

MSEs* = Three MSEs of 15 Marks each will conducted and marks of better 2 of these 3 MSEs will be considered for Continuous Assessment

TA ** = for Theory : 20 marks on lecture quizzes, 8 marks on assignments, 2 marks on class performance

TA = for Practical : MSPA will be 15 marks each**

V Semester

CE	CVM101 : Strength of Materials			L=3	T=0	P=0	Credits= 3
Evaluation Scheme *Best Two out of three MSE's would be considered	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Tota	ESE Durat ion
	15	15	15	30	40	100	3 Hrs.
Prerequisites							

COURSE OBJECTIVES	COURSE OUTCOMES
Students should be able to 1. To analyze the structural elements and find stresses. 2. To compute quantities of S.F. and B.M. and principal stresses. 3. To determine the deflections in beams by various methods which is an important criteria in design 4. To investigate state of stress in three dimensions and various theories of failure in designing the structural members 5. To interpret failure pattern of metal under different action	Students should be able to 1. Understand basic concepts and mechanical properties of materials. 2. Analyze behavior of material under various types of loading pattern. 3. Illustrate diagram showing variation of shear force, bending moment and stresses. 4. Outline the feasibility of different sections subjected to different loading patterns.
Mapped Program Outcomes : 1, 2, 10,	

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UNIT–1 : **Simple Stresses and Strains:** Stress- tensile and compressive, strain, strain energy, stress-strain diagram, properties of materials, impact loading, varying cross-section and load, temperature stresses.	**[06 Hrs.]**
UNIT–2 : **Shear force and bending moment diagram:** Axial force, shear force and bending moment diagram. Relation between bending moment, shear force and loading.	**[07 Hrs.]**
UNIT–3 : **Stresses in beam:** Theory of simple bending, Bending stresses in simple beam. Shear stresses in simple beams and shear stress distribution.	**[06 Hrs.]**
UNIT–4 : **Torsion of Shaft:** Torsion of circular sections, assumptions and derivation of relation between torsional moment, shear stress and angle of twist.	**[07 Hrs.]**
UNIT–5 : **Deflection of Beams**: Derivation of differential equation of elastic curve, Differential Equation relating deflection moment, shear and load.	**[07 Hrs.]**

UNIT–6 : **Compound Stress and Strains:** State of stress at a point, Oblique stress, simple tension, pure shear, general two-dimensional stress system, principle planes, principle stresses and strains, Poisson's ratio, Maximum shear stress.	**[06 Hrs.]**

Text Books:

	Title	Edition	Author	Publisher
1	Strength of Materials	3rd Edition	Bhavikatti S. S	Vikas Publication House Pvt. Ltd., Noida, UP,
2	Engineering Mechanics of Solids	4th Edition	Popov E.P	Printice Hall,

Reference Book:

	Title	Edition	Author	Publisher
1	Strength of Materials		Chakraborti, M.,	S. K. Kataria& Sons
2	Mechenics of Material		Pytel A., Kivsalaas J.,	Cengage Learning, (Indian Edition),
3	Strength of Materials and Machine Element	2nd Edition	Shah V.L., Ogale R.A	Jain Book Agency, New Delhi

V Semester

CVM102	LAB : Strength of Materials			L=0	T=0	P=1	Credits=1
Evaluation Scheme	MSPA-I	MSPA-II	MSPA-III	TA	ESE	Total	ESE Duration
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COURSE OBJECTIVES	COURSE OUTCOMES
Students should be able to 1. To study suitability of various materials for civil engineering construction. 2. To study the resistance offered by various materials against the external forces	Students should be able to 1. Understand basic concepts & mechanical properties of material. 2. Categorize behavior of various materials such as Steel, Aluminum, Wood etc. when subjected to various types of loading.
Mapped Program Outcomes : 1, 2	

PRACTICAL:
Minimum **Ten** practical to be performed from the list as below:-

1. To study the universal testing machine and its accessories.
2. To determine tension test on metal.
3. To determine flexural strength of timber beam.
4. To determine modulus of rigidity of M.S. bar by torsion test.
5. To determine impact value of metal by Charpy Impact Test and Izod Impact Test.
6. To determine Rockwell hardness number for M.S. and Aluminium bar.
7. To determine Brinell hardness number for M.S. and Aluminium bar.
8. To determine the stiffness of spring and modulus of rigidity.
9. To perform shear test on metals.
10. To determine the compressive strength of specimen.
11. To determine flexural test on roofing tiles, flooring tiles and bricks.
12. To determine the test on masonry bond strength of bricks.

V Semester

CVM111	Basics of Building Construction			L=3	T=0	P=0	Credits= 3
Evaluation Scheme *Best Two out of three MSE's would be considered	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Tota	ESE Duration
	15	15	15	30	40	100	3 Hrs.
Prerequisites							

COURSE OBJECTIVES	COURSE OUTCOMES
Students should be able to 1. To understand the importance Building Materials used for Brick / stone masonary, Windows and doors, flooring and roofs. 2. To understand the importance of Building Planning. 3. To understand the importance of Building Design.	Students should be able to 1. Identify different building materials. 2. Demonstrate properties of different material. 3. Apply various principles of building planning.
Mapped Program Outcomes : 1, 6, 7, 9	

UNIT–1 : **Building materials** A) Stones : Stones Requirements of good building stones, IS specification and tests on stones; stone masonry B) Brick and block masonry: Characteristics of good building bricks, IS specifications and test; Classification of bricks.	**[06 Hrs.]**
UNIT–2 : **Materials for Doors and windows** Functional requirements, materials of doors and windows, glazing, method of fixing doors and windows, fixtures and fastenings. Timber Types and properties, seasoning, testing; Glass – Types and properties.	**[07 Hrs.]**
UNIT–3 : **Flooring and Roof material,** (A) Flooring materials, tests and IS specifications: Ground and upper floors; Flooring functional requirements of flooring material, varieties of floor finishes and their suitability. (B) Roofing materials: GI, AC, fiber sheets, Mangalore tiles; Roof construction – types and their suitability.	**[06 Hrs.]**
UNIT–4 : **Miscellaneous materials** Properties , types and uses of following materials, Lime, Ferrous metals, Polymers, Plastics types, Mastic, Gypsum, Ferro Crete, Clay Tiles and glazed ware, Plaster of Paris. Artificial stone; Aluminium and alloys– Properties.	**[06 Hrs.]**

UNIT–5 : **Building planning** Principle of Building planning, Integrated approach in Built Environment, Building Rules and Byelaws, Necessity of laws, plot sizes, road width, open spaces, floor area ratio (F.A.R.), marginal distances, building line control line, height regulation, Built-up area, floor area, carpet area, Landscape elements and elements of interior decoration.	**[07 Hrs.]**
UNIT–6 : **Building Design** Introduction, Types of load, thermal insulation of roofs and walls. Ventilation : Necessity of ventilation, stack effect, wind effect, Mechanical ventilation, objectives, selection of ventilation system, ventilation rate, Lighting**:** Principles, Day lighting, design of windows, sky component, E.R.C, Orientation, artificial illumination, supplementary illumination.	**[07 Hrs.]**

Text Books:

	Title	Edition	Author	Publisher
1	Building drawing an Integrated approach to Built environment	Fifth edition	Shah M.G., Kale C.M. and Patki S.Y	Tata McGraw Hill
2	Building Design and Constructions	Second edition	Mentt	Tata McGraw Hill

Reference Book:

	Title	Edition	Author	Publisher
1	National Building Code of India 2016			Bureau of Indian Standard, New Delhi
2	Materials of Construction		Ghosh	Tata McGraw Hill
3	Materials for Civil and Construction Engineers	3rd Ed.,	M. S. Mamlouk and J. P. Zaniewski	Prentice Hall
4	Building Materials		P.C. Varghese	PHI Learning Pvt. Ltd., India
5	Civil Engineering Materials		TTTI Chandigrah	Tata McGraw Publication

VI Semester

CVM112	Water Supply and Sanitation			L=3	T=0	P=0	Credits= 3
Evaluation Scheme *Best Two out of three MSE's would be considered	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Tota	ESE Duration
	15	15	15	30	40	100	3 Hrs.
Prerequisites							

COURSE OBJECTIVES	COURSE OUTCOMES
Students should be able to 1. To study various components of public water supply scheme. 2. To study water quality and water treatment. 3. To study sewage collection and conveyance. 4. To study the working of sewage treatment units and processes.	Students should be able to 1. Explain water supply scheme and its importance. 2. Discuss the water quality and water treatment. 3. Explain the effective sewage collection, conveyance and construction of sewerage system. 4. Discuss the working of sewage treatment units and processes.
Mapped Program Outcomes : 1, 2, 7,	

UNIT–1 : Introduction, Importance necessity of water supply scheme, water demand, population forecasting methods, numerical, intake structures, conveyance of water and pumps.	**[07 Hrs.]**
UNIT–2 : Water quality, general idea of water borne diseases, characteristics of water, standards of drinking water, water treatment, objective of treatment, conventional water treatment plant flow sheet, aeration, coagulation and sedimentation.	**[07 Hrs.]**
UNIT–3 : Filtration, types of filters, disinfection, chlorination, distribution systems, layouts of DS and storage reservoirs for treated water.	**[06 Hrs.]**
UNIT–4 : System of collection, conveyance of sewage, sewer types, shapes, construction of sewer, sewer appurtences, sewer testing and maintenance.	**[06 Hrs.]**
UNIT–5 : Characteristics of wastewater, BOD, COD, BOD rate constant, sewage treatment flow sheet & site selection for sewage treatment plant, preliminary and primary treatment.	**[07 Hrs.]**

UNIT–6 : Secondary treatments, biological treatment, activated sludge process, trickling filter, methods of disposal, sludge digestion & sludge drying beds, recycle & reuse of sewage.	**[06 Hrs.]**

Text Books:

	Title	Edition	Author	Publisher
1	Water Supply & Sanitary Engineering (Vol.–I & II),		Modi P.N	Standard Book
2	Water Engineering & Sanitary Engineering	2nd Edition	Punmia B. C	Laxmi Publication, New Delhi
3	Water Supply and Sanitary Engineering	4th Edition	Birdie G.S., Birdie J.S	DhanpatRai Publication, New Delhi
4	Water Supply Sanitary Engineering		S. K. Garg	Khanna Publications

Reference Book:

	Title	Edition	Author	Publisher
1	Water supply and Sewarage,	6^{th} Edition	E.W. Steel, T.J. McGhee	McGraw-Hill Education
2	Water and wastewater Engineering		Fair, Geyer and Okun	John Wiley & Sons Ltd

VI Semester

CVM113	LAB : Water Quality Analysis			L=0	T=0	P=1	Credits=1
Evaluation Scheme	MSPA-I	MSPA-II	MSPA-III	TA	ESE	Total	ESE Duration
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COURSE OBJECTIVES	COURSE OUTCOMES
Students should be able to 1. To study various components of public water supply scheme. 2. To study water quality and water treatment. 3. To study sewage collection and conveyance. 4. To study the working of sewage treatment units and processes.	Students should be able to 1. Explain water supply scheme and its importance. 2. Discuss the water quality and water treatment. 3. Explain the effective sewage collection, conveyance and construction of sewerage system. 4. Discuss the working of sewage treatment units and processes.
Mapped Program Outcomes : 1, 2, 7,	

PRACTICALS : -

Minimum of **Ten** practical from the list given below shall be performed.

1. Determination of pH.
2. Determination of Conductivity
3. Determination of Chlorides
4. Determination of Solid's
5. Determination of Turbidity
6. Determination of Alkalinity
7. Determination of Acidity.
8. Determination of Dissolved Oxygen.
9. Determination of Hardness
10. Determination of Available Chlorine
11. Determination of Residual Chlorine
12. Determination of OCD by Jar Test.
13. Bacteriological MPN tests.
14. Bacteriological Plate count test.
15. B.O.D. test
16. C.O.D. test

VI Semester

CVM121	Fundamentals of Transportation Engineering			L=3	T=0	P=0	Credits= 3
Evaluation Scheme *Best Two out of three MSE's would be considered	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Tota	ESE Duration
	15	15	15	30	40	100	3 Hrs.
Prerequisites							

COURSE OBJECTIVES	COURSE OUTCOMES
Students should be able to 1. To understand importance of transportation. 2. To acquaint development in transportation. 3. To study basics of various modes of transportation. 4. To understand Traffic engineering regulations.	Students should be able to 1. Identify the basic knowledge of Transportation engineering. 2. Explain the concepts of various modes of transportation. 3. Illustrate the characteristics of traffic engineering. 4. Distinguish appropriate regulations as per various Traffic engineering.
Mapped Program Outcomes : 1,2,11	

UNIT–1 : Importance of Transportation in Nation Development, Different modes of Transportation, Introduction to Road Transportation.	**[06 Hrs.]**
UNIT–2 : Traffic Engineering: users, regulations, signs, signals.	**[07 Hrs.]**
UNIT–3 : Introduction to various organizations and government bodies for transportation sector in India.	**[06 Hrs.]**
UNIT–4 : Introduction to Railway transportation & Metro and its development.	**[07 Hrs.]**
UNIT–5 : Introduction to Air transportation and development.	**[07 Hrs.]**
UNIT–6 : Introduction to Water transportation and its development.	**[06 Hrs.]**

Text Books:				
	Title	**Edition**	**Author**	**Publisher**
1	Highway engineering		Khanna& Justo	Nem Chand & Bros
2	Highway Engineering		K.L. Bhanot	S. Chand &Company (P) Ltd. New Delhi
3	Railway Engineering		Saxena	Dhanpat Rai Publication
	Airport Planning & Design		Goyal& Praveen Kumar	Galgotia Publication
4	Railway Engineering		Rangwala	Charotar Publishing House
5	Airport Engineering		Rangwala	Charotar Publishing House
6	Dock and Tunnel Engineering	26th Edition	Srinivasan R. Harbour	

Reference Book:				
	Title	**Edition**	**Author**	**Publisher**
1	Indian Road Congress, IRC handbooks			International Code Council
2	Textbook on Transportation Engineering		S.P. Chandola	S. Chand Publishers, New Delhi

VII Semester

CVM122	Civil Engineering Materials			L=3	T=0	P=0	Credits= 3
Evaluation Scheme *Best Two out of three MSE's would be considered	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Tota	ESE Durat ion
	15	15	15	30	40	100	3 Hrs.
Prerequisites							

COURSE OBJECTIVES	COURSE OUTCOMES
Students should be able to 1. To understand the importance Civil Engineering Material used for Construction Materials 2. To study fundamentals of cement &concrete. 3. To study new Construction Materials and its uses.	Students should be able to 1. Identify different Construction Materials. 2. Explain various constituents of Cement & Concrete 3. Demonstrate properties of different material.
Mapped Program Outcomes : 5,7,9,11	

UNIT–1 : **Introduction to Civil Engineering Material**-Scope of the Subject, Selection Criteria of Construction Material, Classification of Civil Engineering Material, Properties of Civil Engineering Material.	**[06 Hrs.]**
UNIT–2 : **Introduction to** Cement, its Type, Properties and Uses of cement, Ingredients of cement, Manufacture of cement (Flow Diagram), Composition and function of cement clinker, Standard test of cement, Cement water Proofers, Admixtures.	**[07 Hrs.]**
UNIT–3: **Introduction to Stones & Bricks: -** Stone as building material, Criteria for selection, Tests on stones, Deterioration and Preservation of stone work. Bricks, Classification, Manufacturing of clay bricks, various tests etc.	**[06 Hrs.]**
UNIT–4 : **Introduction to Concrete:-** Introduction to IS-456 **(**Plain And Reinforced Concrete),Ingredients, Manufacturing Process, Batching plants, mixing, transporting, placing, compaction of concrete, curing and finishing, Ready mix Concrete, Mix specification.	**[06 Hrs.]**
UNIT–5 : **New Construction Materials:** Fibers and its types, Pre - Engineered Building and its Application & Advantages.	**[07 Hrs.]**

UNIT–6 : **Additives and admixtures:** Types of admixtures, natural products, diatomaceous earth, calcined clays of shales, volcanic glasses, by products–pozzolana, fly ash, silica fume, rice husk ash, metakaolin, G.G. blast furnace slag, admixtures- air entraining, water reducing, accelerators, retarders, plasticizers and superplasticizers, permeability reducing, grouting agents, surface hardeners.	**[07 Hrs.]**

Text Books:

	Title	Edition	Author	Publisher
1	Concrete Technology	6th Edition	M.S. Shetty	S. Chand & Company, Limited,.
2	Building Construction	32nd Edition	Rangwala	Charotar Publishing House Pvt. Ltd

Reference Book:

	Title	Edition	Author	Publisher
1	Construction Technology		Sankar, S.K. and Saraswati, S.,	Oxford University Press, New Delhi
2	Building Construction	19th Edition	Sushil Kumar	Standard Publisher Distributors , New Delhi
3	Elements of Civil Engineering		S. S. Bhavikatti	Vikas Publishing House Pvt Limited
4	Basic Civil Engineering		By Dr. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain	Firewall Media

VII Semester

CVM123	LAB : Civil Engineering Materials			L=0	T=0	P=1	Credits=1
Evaluation Scheme	MSPA-I	MSPA-II	MSPA-III	TA	ESE	Total	ESE Duration
	--	--	--	60	40	100	3 Hrs

COURSE OBJECTIVES	COURSE OUTCOMES
Students should be able to 1. To understand the importance Civil Engineering Material used for Construction Materials 2. To study fundamentals of cement &concrete.. 3. To study new Construction Materials and its uses.	Students should be able to 1. Identify different Construction Materials. 2. Explain various constituents of Cement & Concrete 3. Demonstrate properties of different material.
Mapped Program Outcomes : 5,7,9,11	

1. To determine the normal consistency and initial setting time and final setting time by Vicat's apparatus.
2. To perform soundness test of cement.
3. To determine water absorption of roofing tiles, flooring tiles and bricks.
4. To determine the bulking of sand & plotting bulking curve.
5. To determine the compressive strength of cement.
6. To determine the workability of concrete by slump cone apparatus.
7. To determine the workability of concrete by Vee bee apparatus.
8. To determine the compressive strength of brick
9. To design the concrete mix of required characteristic strength according to I.S .method.
10. To determine surface hardness by using Rebound hammer.
11. To Determine Compressive strength of High grade concrete by using different admixture.
12. To Study of IS code related to mix design

YESHWANTRAO CHAVAN COLLEGE OF ENGINEERING
(An Autonomous Institution affiliated to R T M Nagpur University Nagpur)
Accredited by NAAC (1st Cycle) with 'A' Grade (Score 3.25 on 4 Point Scale)
Wanadongri, Hingna Road, Nagpur-441110

Department of Mechanical Engineering
(Minor in IMAML)

B.E. Minor in Integrated Manufacturing and Machine Learning
SoE & Syllabus 2022-23

B.E. Minor In Integrated Manufacturing and Machine Learning

Information Brochure of Minor Program

1. Title of Program: **INTEGRATED MANUFACTURING AND MACHINE LEARNING**
2. Type of Program: **Minor**
3. Department offering the program: **Mechanical Engineering**
4. Industry / Association / Collaboration: _Nil
5. Department/s eligible to opt for the program:

   The students from CV, EL, EE, ETC, CT, IT, CSE are eligible to opt for this program. Department of Mechanical Engineering students are not permitted to opt for the program

6. General information about courses in program:

   The nature of manufacturing systems faces ever more complex, dynamic and at times even chaotic behaviors. In order to being able to satisfy the demand for high-quality products in an efficient manner, it is essential to utilize all means available. One area, which saw fast pace developments in terms of not only promising results but also usability, is machine learning. Promising an answer to many of the old and new challenges of manufacturing, machine learning is widely discussed by researchers and practitioners alike. However, the field is very broad and even confusing which presents a challenge and a barrier hindering wide application. Manufacturing is a very established industry, however the importance of it cannot be rated high enough. Several mature economies experienced a reduction of the manufacturing contribution toward their GDP over the last decades. However, in the last years, several initiatives to revamp the manufacturing sector were started. This course contributes in presenting an overview of available machine learning techniques and structuring this rather complicated area. A special focus is laid on the potential benefit, and examples of successful applications in a manufacturing environment.

7. Employability potential of program:

   Number of graduates produced in each year by higher education institutions is increasing. Thus prediction of employability of graduate's plays a vital role for any industry for proper talent

acquisition and Utilization and also it helps students in identifying the qualification and skills that they need to improve, before completion of degree to get desired jobs. In this Digital Revolution, informal learning and skill enhancements is happening in unconditional method, relating and converging all this learning's to the employability rate is one of a biggest issue. The main objective is to address this issue by predicting and forecasting the skill acquisition continuously and mapping to industry needs using machine learning Algorithms. The proposed course used different machine learning algorithms like Logistic Regression, Decision tree, k-nearest neighbor, Support Vector Machine and Naïve Bayes for building model where ANN classifier resulted with the highest accuracy. This course would be helpful for all the students for employability prediction

8. Departmental Steering committee: For proper publicity / conduct of program

SN	Name of the Faculty Member	Post	Designation	e-mail ID	Contact Number
1	Dr. S. S. Chaudhari	Chairman	HOD	hod_me@ycce.edu	9545531727
2	Dr.J.P.Giri	Member	Associate Professor	jayantpgiri@gmail.com	9822929871
3	Prof.A.P.Edlabadkar	Member	Assistant Professor	ajinkyae@gmail.com	9764478622
4	Prof.A.R.Narkhede	Member	Assistant Professor	alok.narkhede@gmail.com	7666767483

9. Departmental coordinator

SN	Name of the Faculty Member	Post	Designation	e-mail ID	Contact Number
1	Prof.A.R.Narkhede	Member	Assistant Professor	alok.narkhede@gmail.com	7666767483

Scheme of Examinations
B.E. Minor in Integrated Manufacturing and Machine Learning

SN	Sem	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
					L	T	P	Hrs		MSEs*	TA**	ESE	
1	5	MEM101	Mechatronics	**T**	3	0	0	3	3	30	30	40	3
2	5	MEM102	Lab: Mechatronics	**P**	0	0	2	1	1	---	60	40	3
3	5	MEM103	Computer Integrated Manufacturing	**T**	3	0	0	3	3	30	30	40	3
4	6	MEM111	Fluid Power System	**T**	3	0	0	3	3	30	30	40	3
5	6	MEM112	Lab: Fluid Power System	**P**	0	0	2	1	1	---	60	40	3
6	6	MEM113	Machine Learning	**T**	3	0	0	3	3	30	30	40	3
7	7	MEM121	Industrial Robotics	**T**	3	0	0	3	3	30	30	40	3
8	7	MEM122	Lab Industrial Robotics	**P**	0	0	2	1	1	---	60	40	3
			TOTAL		**15**	**0**	**6**	**18**	**18**				

MSEs* = Three MSEs of 15 Marks each will conducted and marks of better 2 of these 3 MSEs will be considered for Continuous Assessment

TA ** = for Theory : 20 marks on lecture quizzes, 8 marks on assignments, 2 marks on class performance

TA = for Practical : MSPA will be 15 marks each**

V Semester

MEM101	Mechatronics			L=3	T=0	P=0	Credits= 3
Evaluation Scheme *Best Two out of three MSE's would be considered	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Tota	ESE Duration
	15	15	15	30	40	100	3 Hrs.
Prerequisites							

Objective	Course Outcome
(1)Understand the concept of Mechatronics (2)Develop the ability to understand the working of various electronically and computer control devices. (3)Concept development to bridge the existing gap between machines, Automation and Computer control system.	(I) Students will be able to model various mechatronic systems. (II) Students will be able to understand the working of various motors used in mechatronic systems. Analyze the characteristics and use of various IC's (III) Student will be able to analyze the characteristics and use various IC's. (IV) Students will be able to analyze the internal hardware structure in Mechatronics Systems.

Unit 1 **[7 hrs]**

Introduction, sensors, actuators, modeling of systems. Recent trend of designing machine units along with electronic circuits for operation and supervision of mechanisms. Techniques of interfacing mechanical devices with computer hardware.

Unit 2 **[8 hrs]**

Basic principles ,working and specific applications of armature and field controlled D.C. Motors, Variable voltage and variable frequency control of 3 phase and single phase Induction motors, speed control of synchronous motors, Different types of stepper motors-Constriction ,working and application. Position control of stepper motors.

Unit 3 **[8 hrs]**

Common and commercial I.Cs used for amplification, timing and digital indication.
Different types of actuators, working of synchro-transmitter and receiver set, Pressure to current (P/I) and l/P conversion. Electrical and hydraulic servomotors.
Design of solenoid plungers and pressure and force amplification devices.

Unit 4 **[7 hrs]**

Add-on cards for sampling and actuation, 4-20 mA ports, AD-DA conversion, Peripheral interface organization, general layout of data bus and data transfer through serial and parallel modes of communication, schemes of computer networking and hierarchy in supervisory control.

Unit 5 **[8 hrs]**

Study of various integrated systems by using block diagrams. Study of systems used in Ink Jet Printers, Photo copying, Washing Machines, IC Engine fuel injection system etc

Unit 6 **[7 hrs]**

General philosophy of Artificial Neural Network simulations, Fuzzy logic for operation and control of mechatronic systems.

Text books:

S.N.	Title of the book	Edition (Year of publication)	Author(s)	Publisher
1	Introduction to Mechatronics and Measurement Systems	2007	Michael B.Histand and David G. Alciatore	Tata McGraw-Hill Education
2	Mechatronics	2007	Bradley, D.A., Dawson, D, Buru, N.C. and Loader, AJ.,	Chapman and Hall, 1991
3	Microprocessor Architecture, Programming and Applications	2002	Ramesh.S, Gaonkar	Prentice Hall
4	Understanding Electro-Mechanical Engineering, An Introduction to Mechatronics	1996	Lawrence J.Kamm	John Wiley and Sons
5	Introduction to Microprocessors for Engineers and Scientists	2004,	Ghosh, P.K. and Sridhar	PHI Learning Pvt. Ltd.

V Semester

MEM102	Lab : Mechatronics			L= 0	T = 0	P = 1	Credits = 1
Evaluation Scheme	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
*Best Two out of three MSE's would be considered	--	--	--	60	40	100	3 Hrs
Prerequisites							

Objective	Course Outcome
(1) Understand the concept of Mechatronics (2) Develop the ability to understand the working of various electronically and computer control devices. (3) Concept development to bridge the existing gap between machines, Automation and Computer control system.	(I) Students will be able to model various mechatronic systems. (II) Students will be able to understand the working of various motors used in mechatronic systems.. Analyze the characteristics and use of various IC's. (III) Student will be able to analyze the characteristics and use various IC's. (IV) Students will be able to analyze the internal hardware structure in Mechatronics Systems.

List of Practical (Minimum 10 Experiments)

1. Verification of P, P+I, P+D, P+I+D control actions.
2. Demonstration on XY position control systems.
3. Demonstration on linear conveyor control system.
4. Demonstration on rotary table positioning systems.
5. Demonstration on different switches and relays.
6. Analysis of control system using software like MATLAB/SIMULINK or equivalent.
7. Development of ladder diagram/programming PLC for level control, position control or any other mechanical engineering application.
8. Demonstration on A/D and D/A converters.
9. Demonstration on Flip Flops and Timers.
10. Demonstration on Application of Op – Amp circuits.
11. Demonstration on Data acquisition system.
12. Demonstration on Microcontrollers. .

V Semester

MEM103	Computer Integrated Manufacturing			L=3	T=0	P=0	Credits= 3
Evaluation Scheme *Best Two out of three MSE's would be considered	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Tota	ESE Duration
	15	15	15	30	40	100	3 Hrs.
Prerequisites							

Objective	Course Outcome
To develop in the engineering students the ability to analyze any engineering problem in a simple and logical manner and to apply to its solution a few, well understood basic principles.	**CO1 : The Students will have ability to design and evaluate experimentation on CNC machines.** **CO2: Designing of GT cell layouts for transforming into flexible manufacturing system.** **CO3: The students will be able to compose and transform robot programs various industrial applications.** **CO4: The students will have ability to justify CAPP and CAQC to design computer integrated manufacturing**

Unit 1 **[7 hrs]**

Concept and scope of CIM, components of CIM, benefits, limitations.Basics of computer graphics NC basics, NC words, Manual part programming (NC part programming) Punch Tape, Tape Format CNC , DNC, APT programming Adaptive control, application. Tooling for CNC machine.

Unit 2 **[7 hrs]**

Introduction to Group Technology, Limitations of traditional manufacturing systems, characteristics and design of groups, benefits of GT and issues in GT. Part families , classification and coding , Production flow analysis , Machine cell design , Benefits

Unit 3 **[8 hrs]**

Introduction & Components of FMS , Application work stations , Computer control and functions , Planning, scheduling and control of FMS , Scheduling , Knowledge based scheduling , Hierarchy of computer control , Supervisory computer Manufacturing data systems , data flow , CAD/CAM considerations , Planning FMS database]

Unit 4 **[8 hrs]**

Industrial robotics Robot anatomy, Robot control, accuracy, repeatability, End Effectors Sensor, Introduction to robot programming, Robot application (Material handling processing assembly and inspection) introduction to robot Kinematics.

Unit 5 **[10 hrs]**

Process Planning in the Manufacturing cycle , Process Planning and Production Planning Process Planning and Concurrent Engineering, CAPP, Variant process planning , Generative approach , Forward and Backward planning, Input format, Logical Design of a Process Planning , Implementation considerations ,manufacturing system components, Automated material handling systems, AS/RS, general considerations , selection, evaluation and control . Inspection and Quality control, CAQC, CMM types, working, applications Expert process planning

Unit 6 **[5 hrs]**

Totally integrated process planning systems, Integration of CNC robotics for CIM, Agile manufacturing, Nano Manufacturing. Simulation

.Reference books:

S.N.	Title of the book	Edition (Year of publication)	Author(s)	Publisher
1	Systems Approach to Computer Integrated Design and Manufacturing	1996	Nanua Singh	John Wiley & Sons, 1996.
2	Automation, Production Systems and Computer Integrated Manufacturing	2002	Groover M.P	Prentice-Hall of India Pvt. Ltd., New Delhi, 2002
3	Handbook of Flexible Manufacturing Systems	1991	Jha, N.K	Academic Press Inc., 1991
4	Group Technology in Engineering Industry	1979	Burbidge, J.L	Mechanical Engineering pub. London, 1979.
5	G.T Planning and Operation, in The automated factory-HandBook: Technology and Management	1991	Askin, R.G. and Vakharia, A.J	Cleland, D.I. and Bidananda, B (Eds), TAB Books, NY, 1991.

VI Semester

MEM111	Fluid Power Systems			L=3	T=0	P=0	Credits= 3
Evaluation Scheme *Best Two out of three MSE's would be considered	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Tota	ESE Duration
	15	15	15	30	40	100	3 Hrs.
Prerequisites							

Objective	Course Outcome
• To provide an insight into the capabilities of hydraulic and pneumatic fluid power. • To understand concepts and relationships surrounding force, pressure, energy and power in fluid power systems. • To examine concepts centering on sources of hydraulic power, rotary and linear actuators, distribution systems, hydraulic flow in pipes, and control components in fluid power systems. • Exposure to build and interpret hydraulic and pneumatic circuits related to industrial applications. • To familiarize with logic controls and trouble shooting	**CO1** **Identify and analyse the functional requirements of a fluid power transmission system for a given application.** **CO2** **Visualize how a hydraulic/pneumatic circuit will work to accomplish the function.** **CO3** **Design an appropriate hydraulic or pneumatic circuit or combination circuit like electrohydraulic, electro-pneumatics for a given application.** **CO4** **Select and size the different components of the circuit.** **CO5** **Develop a comprehensive circuit diagram by integrating the components selected for the given application.**

Unit 1 **[7 hrs]**

Introduction to fluid power systems Fluid power system: components, advantages and applications. Transmission of power at static and dynamic states. Pascal's law and its applications. Fluids for hydraulic system: types, properties, and selection. Additives, effect of temperature and pressure on hydraulic fluid. Seals, sealing materials, compatibility of seal with fluids. Types of pipes, hoses, and quick acting couplings. Pressure drop in hoses/pipes. Fluid conditioning through filters, strainers; sources of contamination and contamination control; heat exchangers.

Unit 2 **[8 hrs]**

Pumps and actuators Pumps: Classification of pumps, Pumping theory of positive displacement pumps, construction and working of Gear pumps, Vane pumps, Piston pumps, fixed and variable displacement pumps, Pump performance characteristics, pump selection factors, problems on pumps. Accumulators: Types, selection/ design procedure, applications of accumulators. Types of Intensifiers, Pressure switches /sensor, Temperature switches/sensor, Level sensor.

Actuators: Classification cylinder and hydraulic motors, Hydraulic cylinders, single and double acting cylinder, mounting arrangements, cushioning, special types of cylinders, problems on cylinders.

Construction and working of rotary actuators such as gear, vane, piston motors, and Hydraulic Motor. Theoretical torque, power, flowrate, and hydraulic motor performance; numerical problems. Symbolic representation of hydraulic actuators (cylinders and motors)

Unit 3 **[8 hrs]**

Components and hydraulic circuit design

Components: Classification of control valves, Directional Control Valves-symbolic representation, constructional features of poppet, sliding spool, rotary type valves solenoid and pilot operated DCV, shuttle valve, and check valves. Pressure control valves - types, direct operated types and pilot operated types. Flow Control Valves -compensated and non-compensated FCV, needle valve, temperature compensated, pressure compensated, pressure and temperature compensated FCV, symbolic representation.

Hydraulic Circuit Design: Control of single and Double -acting hydraulic cylinder, regenerative circuit, pump unloading circuit, double pump hydraulic system, counter balance valve application, hydraulic cylinder sequencing circuits, cylinder synchronizing circuit using different methods, hydraulic circuit for force multiplication; speed control of hydraulic cylinder- metering in, metering out and bleed off circuits. Pilot pressure operated circuits. Hydraulic circuit examples with accumulator.

Unit 4 **[09hrs]**

Pneumatic power systems Introduction to Pneumatic systems:

Pneumatic power system, advantages, limitations, applications, Choice of working medium. Characteristics of compressed air and air compressors. Structure of pneumatic control System, fluid conditioners-dryers and FRL unit.

Pneumatic Actuators: Linear cylinder –types of cylinders, working, end position cushioning, seals, mounting arrangements, and applications. Rotary cylinders- types, construction and application, symbols.

Pneumatic Control Valves: DCV such as poppet, spool, suspended seat type slide valve, pressure control valves, flow control valves, types and construction, use of memory valve, Quick exhaust valve, time delay valve, shuttle valve, twin pressure valve, symbols..

Unit 5 **[09hrs]**

Pneumatic control circuits

Simple Pneumatic Control:

Direct and indirect actuation pneumatic cylinders, speed control of cylinders - supply air throttling and exhaust air throttling.

Signal Processing Elements:

Use of Logic gates - OR and AND gates in pneumatic applications. Practical examples involving the use of logic gates.

Multi- Cylinder Application:

Coordinated and sequential motion control, motion and control diagrams. Signal elimination methods, Cascading method principle, Practical application examples (up to two cylinders) using cascading method (using reversing valves).

Electro- Pneumatic Control:

Principles - signal input and output, pilot assisted solenoid control of directional control valves, use of relay and contactors. Control circuitry for simple signal cylinder application.

Unit 6	**[3hrs]**
Applications of Power systems Practical and Industrial Applications	

TEXT BOOKS:

1. Anthony Esposito, "Fluid Power with applications", Pearson edition,2000 .
2. Majumdar S.R., "Oil Hydraulics",TalaMcGRawHllL, 2002 .
3. Majumdar S.R., "Pneumatic systems - Principles and Maintenance",Tata McGraw-Hill, New Delhi, 2005

REFERENCE BOOKS:

1. John Pippenger, Tyler Hicks, "Industrial Hydraulics", McGraw Hill International Edition, 1980.
2. Andrew Par, Hydraulics and pneumatics, Jaico Publishing House, 2005.
3. FESTO, Fundamentals of Pneumatics, Vol I,IIandIII.
4. Herbert E. Merritt, "Hydraulic Control Systems", John Wiley and Sons, Inc.
5. Thomson, Introduction to Fluid power, PrentcieHaIl, 2004
6. John Watton, "Fundamentals of fluid power control", Cambridge University press, 2012.

VI Semester

MEM112	Lab. : Fluid Power Systems			L= 0	T = 0	P = 1	Credits = 1
Evaluation Scheme	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
*Best Two out of three MSE's would be considered	--	--	--	60	40	100	3 Hrs
Prerequisites							

Objective	Course Outcome
• To provide an insight into the capabilities of hydraulic and pneumatic fluid power. • To understand concepts and relationships surrounding force, pressure, energy and power in fluid power systems. • To examine concepts centering on sources of hydraulic power, rotary and linear actuators, distribution systems, hydraulic flow in pipes, and control components in fluid power systems. • Exposure to build and interpret hydraulic and pneumatic circuits related to industrial applications. • To familiarize with logic controls and trouble shooting	**CO1** Identify and analyse the functional requirements of a fluid power transmission system for a given application. **CO2** Visualize how a hydraulic/pneumatic circuit will work to accomplish the function. **CO3** Design an appropriate hydraulic or pneumatic circuit or combination circuit like electrohydraulic, electro-pneumatics for a given application. **CO4** Select and size the different components of the circuit. **CO5** Develop a comprehensive circuit diagram by integrating the components selected for the given application.

List of the practical's.

1) Study of Positive Displacement Rotary Pumps
2) Trial on Reciprocating Pump
3) Trial on Centrifugal Pump
4) Trial on reciprocating compressor
5) Trial on rotary Blower.
6) Trial on Pelton wheel
7) Trial on Francis Turbine
8) Trial on Kaplan Turbine
9) Heat balance on Multicylinder Diesel Engine.
10) Performance on Vapor Compression Refrigeration System (VCRS).
11) Performance on air-conditioning system.

VI Semester

MEM113	Machine Learning			L=3	T=0	P=0	Credits= 3
Evaluation Scheme *Best Two out of three MSE's would be considered	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Tota	ESE Duration
	15	15	15	30	40	100	3 Hrs.
Prerequisites							

Objective	**Course Outcome**
Understanding Human learning aspects. 2. Understanding primitives in learning process by computer. 3. Understanding nature of problems solved with Machine Learning	1.Students will be able to model the learning primitives. 2. Students will be able to build the learning model. 3. Student will be able to tackle real world problems in the domain of Data Mining, Information Retrieval, Computer vision, Linguistics and Bioinformatics.

UNIT – I INTRODUCTION TO MACHINE LEARNING 7 Hours

Why Machine learning, Examples of Machine Learning Problems, Structure of Learning, Learning versus Designing, Training versus Testing, Characteristics of Machine learning tasks, Predictive and descriptive tasks, Machine learning Models: Geometric Models, Logical Models, Probabilistic Models. Features: Feature types, Feature Construction and Transformation, Feature Selection.

UNIT – II CLASSIFICATION AND REGRESSION 8 Hours

Classification: Binary Classification- Assessing Classification performance, Class probability EstimationAssessing class probability Estimates, Multiclass Classification. Regression: Assessing performance of Regression- Error measures, Overfitting- Catalysts for Overfitting, Case study of Polynomial Regression. Theory of Generalization: Effective number of hypothesis, Bounding the Growth function, VC Dimensions, Regularization theory.

UNIT – III LINEAR MODELS 7 Hours

Least Squares method, Multivariate Linear Regression, Regularized Regression, Using Least Square regression for Classification. Perceptron, Support Vector Machines, Soft

Margin SVM, Obtaining probabilities from Linear classifiers, Kernel methods for non-Linea
UNIT – IV LOGIC BASED AND ALGEBRAIC MODELS 6 Hours Distance Based Models: Neighbours and Examples, Nearest Neighbours Classification, Distance based clustering-K means Algorithm, Hierarchical clustering, Rule Based Models: Rule learning for subgroup discovery, Association rule mining. Tree Based Models: Decision Trees, Ranking and Probability estimation Trees, Regression trees, Clustering Trees
UNIT – V PROBABILISTIC MODELS 6 Hours Normal Distribution and Its Geometric Interpretations, Naïve Bayes Classifier, Discriminative learning with Maximum likelihood, Probabilistic Models with Hidden variables: Estimation-Maximization Methods, Gaussian Mixtures, and Compression based Models.
UNIT – VI TRENDS IN MACHINE LEARNING 8 Hours Model and Symbols- Bagging and Boosting, Multitask learning, Online learning and Sequence Prediction, Data Streams and Active Learning, Deep Learning, Reinforcement Learning

Text Books

1. Peter Flach: Machine Learning: The Art and Science of Algorithms that Make Sense of Data, Cambridge University Press, Edition 2012.
2. Hastie, Tibshirani, Friedman: Introduction to Statistical Machine Learning with Applications in R, Springer, 2nd Edition-2012.

Reference Books

1. C. M. Bishop : Pattern Recognition and Machine Learning, Springer 1st Edition-2013.
2. Ethem Alpaydin : Introduction to Machine Learning, PHI 2nd Edition-2013.
3. Parag Kulkarni : Reinforcement and Systematic Machine Learning for Decision Making, WileyIEEE Press, Edition July 2012.

VII Semester

MEM121	Industrial Robotics			L=3	T=0	P=0	Credits= 3
Evaluation Scheme *Best Two out of three MSE's would be considered	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Tota	ESE Duration
	15	15	15	30	40	100	3 Hrs.
Prerequisites							

Objective	Course Outcome
• Gain knowledge of Robotics and automation. • Understand the working methodology of robotics and automation. • Write the program for robot for various applications	On completion of course students will • have knowledge of Robotics, automation, robotics motion, sensors and control, machine vision, robotic programming and roles of robots in industry • Understand the working methodology of robotics and automation, motion and control, machine vision and programming, application of robots in industry. • write the program for robot for various application

Unit 1 **[7 hrs]**

FUNDAMENTALS OF ROBOT

Robot – Definition – Robot anatomy – Co-ordinate systems, work envelope, types and classification – Specifications – Pitch, yaw, roll, joint notations, speed of motion and pay load – Robot parts and their functions – Need for robots – Different applications..

Unit 2 **[8 hrs]**

ROBOT DRIVE SYSTEMS

Pneumatic drives – Hydraulic drives – Mechanical drives – Electrical drives – D.C. servo motors, stepper motor and A.C. servo motors – Salient features, applications and comparison of all these drives.

END EFFECTORS

End effectors – Grippers: Mechanical grippers, pneumatic and hydraulic grippers, magnetic grippers, vacuum grippers, RCC grippers – Two fingered and three fingered grippers – Internal grippers and external grippers – Selection and design considerations.

Unit 3 **[8 hrs]**

SENSORS

Requirements of a sensor, principles and applications of the following types of sensors – Position of sensors (Piezo electric sensor, LVDT, Resolvers, Optical encoders, Pneumatic position sensors) – Range sensors (Triangulation principle, Structured, Lighting approach, Time of flight range finders, Laser range meters) – Proximity sensors (Inductive, Hall effect, Capacitive, Ultrasonic and Optical proximity sensors) – Touch sensors (Binary sensors, Analog sensors) – Wrist Sensors – Compliance Sensors – Slip Sensors.

Unit 4 **[7 hrs]** **MACHINE VISION** Camera, frame grabber, sensing and digitizing image data – Signal conversion – Image Storage – Lighting techniques – Image processing and analysis – Data reduction – Segmentation – Feature extraction – Object recognition – Other algorithms – Applications – Inspection, identification, visual serving and navigation.
Unit 5 **[8 hrs]** **ROBOT KINEMATICS** Forward kinematics – Inverse kinematics – Differences: Forward kinematics and Reverse kinematics of manipulators with two and three degrees of freedom (In 2 dimensional), four degrees of freedom (In 3 dimensional) – Deviations and problems
Unit 6 **[7 hrs]** **ROBOT PROGRAMMING** Teach pendant programming – Lead through programming – Robot programming languages – VAL programming – Motion commands – Sensor commands – End effecter commands – Simple programs. **IMPLEMENTATION** RGV – AGV – Implementation of robots in industries – Various steps - Safety considerations for robot operations.

Text Books:

1. Mikell P. Groover, Mitchel Weiss, Roger N. Nagel, Nicholas G. Odrey and Ashish Dutta, Industrial Robotics: Technology, Programming and Applications, 2 nd Edition, Tata McGraw Hill, 2012.
2. Roland Siegwart, Illah R. Nourbakhsh, an d Davide Scaramuzza, "Introduction to Autonomous Mobile Robots, 2 nd Edition, PHI, 2011

Reference Books:

1. S.P. SukhatMT, Solar Energy: principles of Thermal Collection and Storage, Tata McGraw-Hill (1984).
2. C. S. Solanki, Solar Photovoltaic's: FundaMTntal Applications and Technologies, Prentice Hall of India, 2009.
3. L.L. Freris, Wind Energy Conversion Systems, Prentice Hall, 1990.

VII Semester

MEM122	**Lab. : Industrial Robotics**			L= 0	T = 0	P = 1	Credits = 1
Evaluation Scheme	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
*Best Two out of three MSE's would be considered	--	--	--	60	40	100	3 Hrs
Prerequisites							

Objective	**Course Outcome**
• Gain knowledge of Robotics and automation. • Understand the working methodology of robotics and automation. • Write the program for robot for various applications	On completion of course students will • have knowledge of Robotics, automation, robotics motion, sensors and control, machine vision, robotic programming and roles of robots in industry • Understand the working methodology of robotics and automation, motion and control, machine vision and programming, application of robots in industry. • write the program for robot for various application

List of the practical's.

1. Study components of a real **robot** and its DH parameters.
2. Forward kinematics and validate using a software (Robo Analyser or any other free software tool).
3. Inverse kinematics of the real **robot** and validation using any software.
4. Use of open source computer vision programming tool open CV.
5. Image Processing using open CV.
6. Image processing for color/shape detection.
7. Positioning and orientation of Robotic Arm
8. Control experiment using available hardware and software.
9. Integration of assorted sensors, Micro-controllers and ROS in Robotic arm.

YESHWANTRAO CHAVAN COLLEGE OF ENGINEERING
(An Autonomous Institution affiliated to R T M Nagpur University Nagpur)
Accredited by NAAC (1st Cycle) with 'A' Grade (Score 3.25 on 4 Point Scale)
Wanadongri, Hingna Road, Nagpur-441110

Department of Electrical Engineering
(Minor in EV)

B.E. Minor in Electric Vehicles
SoE & Syllabus 2022-23

B.E Minor in Electric Vehicles

Information Brochure of Minor Program

1. Title of Program: **Minor in Electric Vehicles**

2. Type of Program : **Minor**

3. Department offering the program: **Electrical Engineering**

4. Industry / Association / Collaboration:
   1. Skywing Tech, Pune
      Kanta Height, First floor, Office No. 102 Sr. No. 3/21, opp. Sawata Mali Mandir, Narhe, Pune, Maharashtra 411041
      Contact: 7775901215
      http://www.skywingstech.com

   2. TE connectivity Private Ltd, Bangluru.
      22B Doddenakundi, Second phase Industrial area Whitefield road, Bangluru,Karnataka,560048
      Contact:080-33195000
      www.te.com

5. Department/s eligible to opt for the program:
   The students from CE, ME, EE, ETC, CT , IT , CSE are eligible to opt for this program.
   Department of Electrical Engineering students are not permitted to opt for the program.

6. **General information about courses in program:**
   Theory courses dealt in this minor program:

   - Electrical Machinery(transformer, generator, motor, special machines)
   - Power Electronics(semiconductor devices, converters, inverters, choppers, voltage control methods)
   - Electrical Drives(Drives and Speed Control, selection of motor for traction, PLC, digital speed control)
   - Electric Vehicles(electro mobility, vehicle dynamics, energy storage system, hybrid power trains)
   - Energy Storage and Systems(, Energy storage in electric vehicles, Battery Energy Storage System)

Practical courses dealt in this Minor program:

- Electrical Machinery
- Power Electronics
- Electrical Drives

7. **Advance knowledge or research orientation of Program: NA**

8. **Employability potential of program:**

CT, IT graduates	Developing algorithms for battery management system(BMS), making IoT modules for sharing real-time data generated by EV, Use of AI to improve the efficiency of BMS
ME graduates	Design of thermal system, vehicle and parts design and manufacturing
EE and ETC graduates	Developing firmware for BMS, developing infotainment system, manufacturing and installing sensors in the vehicle, power electronics component selection as per criterion for EV)

9. **Departmental Steering committee: For proper publicity / conduct of program**

SN	Name of the Faculty Member	Post	Designation	e-mail ID	Contact Number
1	Prof. P. S. Shete	Publicity Head	Assistant Professor	pranay.shete85@gmail.com	9421779894
2	Prof. S. L. Tiwari	Member	Assistant Professor	shweta_tiwari200410@rediff.com	9422823380
3	Prof. P. B. Joshi	Member	Assistant Professor	joshi_prasad27@yahoo.com	9975052397

10. **Program Coordinator:**

SN	Name of the Faculty Member	Post	Designation	e-mail ID	Contact Number
1	Dr. S. G. Kadwane	Program coordinator	Professor	sgkadwane@gmail.com	9730459847

Scheme of Examinations
Minor in Electric Vehicles

SN	Sem	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
					L	T	P	Hrs		MSEs*	TA**	ESE	
1	5	ELM101	Electrical Machinery	**T**	3	0	0	3	3	30	30	40	3
2	5	ELM102	Lab: Electrical Machinery	**P**	0	0	2	2	1		60	40	
3	5	ELM103	Power Electronics	**T**	3	0	0	3	3	30	30	40	3
4	5	ELM104	Lab:Power Electronics	**P**	0	0	2	2	1		60	40	
5	6	ELM111	Electric Vehicles	**T**	3	0	0	3	3	30	30	40	3
6	6	ELM112	Electrical Drives	**T**	3	0	0	3	3	30	30	40	3
7	6	ELM113	Lab: Electrical Drives	**P**	0	0	2	2	1		60	40	
8	7	ELM121	Energy Storage Components and Systems	**T**	3	0	0	3	3	30	30	40	3
			TOTAL :		**15**	**0**	**6**	**21**	**18**				

MSEs* = Three MSEs of 15 Marks each will conducted and marks of better 2 of these 3 MSEs will be considered for Continuous Assessment

TA ** = for Theory : 20 marks on lecture quizzes, 8 marks on assignments, 2 marks on class performance

TA = for Practical : MSPA will be 15 marks each**

V Semester

ELM101	Electrical Machinery			L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
*Best Two out of three MSE's would be considered	15	15	15	30	40	100	3 Hrs
Prerequisites	Basic Electrical Engineering						

Course Objective:

1. The basic principle of transfer of electrical power, operation, construction of single and three phase transformers, their classification, connections and phasor diagrams.
2. The basic principle, construction, operation, Performance characteristics, steady state analysis and applications of DC electrical machines, and induction machines.

Course Outcome

Students will be able to

1. Demonstrate the knowledge of Operation of single phase and auto-transformer. Develop, analyse and evaluate vector diagrams and performance indices of single phase and three phase transformer
2. Explain and examine principle, construction, types, operation, speed control, characteristic and applications of DC machines and evaluate performance parameters of d.c.machines
3. Explain and examine principle, construction, operation, starting, speed control ,applications and evaluate the performance indices of induction motors.
4. To study Special Machines and its applications.

UNIT I : ELECTRO MAGNETISM:

Magnetic Circuit, magnetic field due to current carrying conductor and a coil, Right hand grip rule, Force on a current carrying conductor placed in a magnetic field, Flemings Left hand Rule, Magnetization curves of magnetic materials, Magnetic hysteresis and hysteresis loss, Eddy current and loss, leakage flux and fringing, Faraday's laws of electromagnetic induction, Lenz's Law, Flemings's Right hand rule, Types of induced EMF

UNIT II : TRANSFORMER:

Single Phase Transformer: Working principle. EMF equation. Construction of single phase transformer. Ideal transformer, Practical transformer ,Transformer on load , Voltage Regulation.. Open circuit and Short circuit tests on transformer. Efficiency and condition for maximum efficiency. Autotransformer operation. All day efficiency (Only concept).

Three Phase Transformer:Types of 3 phase transformers, Construction, Polarity marking & Test, Transformer connections, Parallel operation of single and three phase transformers

UNIT III : UNIT 3: D.C. GENERATOR:

Construction, Magnetic structure, Field and Armature systems, Field and Armature windings (Both Lap and Wave Types), EMF Equation, Characteristics and applications of different types of D.C. Generators, Building of Emf in D.C. Shunt generator, Armature reaction, commutation

UNIT IV : D.C. MOTOR:

Principle, Torque Equation, Characteristics and applications of various types of D.C. Motors, Starting of D.C. Motors, Speed control of Series and Shunt motors, Power flow in DC machines, Losses and Efficiency in D.C. machines

UNIT V: INDUCTION MOTOR:

Three Phase Induction Motor:
Construction and types. Production of rotating magnetic field. Principle of operation. Torque of an induction motor. Condition for maximum torque. Torque – slip and torque speed characteristics. Applications of three phase induction motor. Starting, Speed control, Crawling and cogging,
Single Phase Induction Motor:
Double – field revolving theory of induction motor. Types of single phase induction motors. Comparison of single phase and three phase induction motor. Applications of single phase induction motor.

UNIT VI: SPECIAL MACHINES:

Induction Generator: Principle, isolated operation, double fed induction generator, applications
Special Machines:
Introduction, Basic Theory and applications of BLDC motor, Switched Reluctance Motor (SRM), Permanent Magnet Synchronous Motor (PMSM)

Text Books:

	Title	Edition	Author	Publisher
1	Electrical Machines	**2nd -1993**	Dr. P. K. Mukherjee and S. Chakravarti	DhanpatRai Publications (P) Ltd
2	Electrical Machines	**3rd -2010**	I.J.Nagrath and Dr.D.P.Kothari	Tata McGraw Hill
3	Electric Machines	**3rd -2016**	Ashfaq Husain	DhanpatRai Publications (P) Ltd.

Reference Book:

	Title	Edition	Author	Publisher
1	A textbook of Electrical Technology Volume II	2005	B.L.Theraja	S.Chand

V Semester

ELM102 :	Lab: Electrical Machinery				L= 0	T = 0	P = 2	Credits = 1
Evaluation Scheme	MSPA 1	MSPA 2	MSPA 3	MSPA 4	TA*	ESE	Total	ESE Duration
	--	--	--	-	60	40	100	
Prerequisites	Basic Electrical Engineering							

Course Objective:

1. The basic principle of transfer of electrical power, operation, construction of single and three phase transformers, their classification, connections and phasor diagrams.
2. The basic principle, construction, operation, Performance characteristics, steady state analysis and applications of DC electrical machines, and induction machines.

Course Outcome

Students will be able to

1. Demonstrate the knowledge of Operation of single phase and auto-transformer. Develop, analyse and evaluate vector diagrams and performance indices of single phase and three phase transformer
2. Explain and examine principle, construction, types, operation, speed control, characteristic and applications of DC machines and evaluate performance parameters of d.c.machines
3. Explain and examine principle, construction, operation, starting, speed control ,applications and evaluate the performance indices of induction motors.
4. To study Special Machines and its applications.

SN	NAME OF EXPERIMENT
1	To evaluate the efficiency and voltage regulation of 1-phase transformer by load test
2	To evaluate the efficiency and voltage regulation of 1-phase transformer by Open Circuit and Short Circuit tests
3	To analyze back to back test on two identical 1-phase transformers
4	To understand conversion of a 2-winding transformer into an autotransformer
5	To apply phasing out and polarity marking on a 3-phase transformer
6	To determine the voltage and current relations in a 3-phase, Delta-Star connected transformer
7	To analyze an Open Circuit and Short Circuit test on a 3-phase transformer
8	To determine the magnetization characteristic of a DC generator.

9	To analyze the speed control of a DC shunt motor by varying -- (a) field excitation and (b) armature voltage
10	To determine the load test on a DC shunt motor.
11	To determine the slip of a 3-phase induction motor by different methods
12	To analyse speed control of a 3-phase slip-ring induction motor by -- (a) variation of a rotor resistance and (b) varying supply voltage
13	To determine the load test on a 3-phase induction motor by indirect loading.
14	To determine the direct loading of 3-phase induction motor by load test .
15	To evaluate the No-Load and Blocked rotor tests on a 3-phase induction motor.
16	To evaluate the No-Load and Blocked rotor tests on a 1-phase induction motor.
17	To determine the operation of an Induction generator.

V Semester

ELM103	Power Electronics			L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
*Best Two out of three MSE's would be considered	15	15	15	30	40	100	3 Hrs
Prerequisites							

Course Objective:

1) Understand the basics of power electronics.
2) Understand SCR"s, MOSFET, UJT, IGBT, Concept of rectification, inversion and commutation

Course Outcome

Students will be able to

1) Demonstrate the learnings of various power semiconductor devices with their protection and apply them for various applications.
2) Analyse different Power Electronics Converter circuits and choose them for suitable applications.
3) Demonstrate the knowledge of chopper circuits, analyse and utilise them for different applications.
4) Analyse inverter circuits with different modulation techniques and identify their application

UNIT I : SCR construction, working and its characteristics, SCR turn off methods, ratings, protection. Construction, working and characteristics of MOSFET and IGBT (in brief) ,TRIAC, Gate driver circuits

UNIT II : Single Phase AC to DC Converters

Single phase line commutated converters, single pulse converter, single phase bridge converter, effect of source inductance, effect of freewheeling diode, single phase half controlled rectifier

UNIT III : Three phase AC to DC Converters

Three phase three pulse converter, three phase bridge converter for resistive and inductive load. Application of converter in Electric Drives

UNIT IV : **D.C. Choppers**

Step down chopper, step up chopper, Control strategies, Multiphase choppers, Application of choppers

UNIT V: Inverters

Single phase half bridge and full bridge inverter, three phase bridge inverters 120^0 and 180^0 mode of conduction, Harmonics in output voltage waveforms

UNIT VI: Inverter output voltage control

Output voltage control, Harmonic attenuation by filters, Single pulse width modulation technique, multiple pulse width modulation technique, Sinusoidal pulse width modulation technique, Harmonic reduction by pulse width modulation techniques, analysis of single pulse width modulation, working of current source inverters, applications. Brief idea of Digital Control

Textbooks:

S.N	TITLE	EDITION	AUTHOR	PUBLICATION
1	Power Electronics Circuit"s Devices And Applications	3rd Edition,2004	M.H.Rashid	Prentice Hall Limited
2	Power Electronics		D.Y.Shingare	Electrotech Publication Engineering Series

Reference books:

S.N	TITLE	EDITION	AUTHOR	PUBLICATION
1	Power Electronics	1981	C.W.Lander	McGraw Hill
2	Thyristors Applications and their	2nd Edition 2002	Dr.M.Ramamoorty	East West Press
3	Thyristors and their Applications		Dr.G.K.Dubey, DoraldaSinha and Joshi	New Age International
4	Power Electronics	1989	Ned Mohan, T.M.Undeland, and W.P.Robbins	John Wiley and Sons

V Semester

ELM104	Lab: Power Electronics				L= 0	T = 0	P = 2	Credits = 1
Evaluation Scheme *Best Two out of three MSE's would be considered	MSPA 1	MSPA 2	MSPA 3	MSPA 4	TA*	ESE	Total	ESE Duration
	--	--	--	--	60	40	100	
Prerequisites								

Course Objective:

1) Understand the basics of power electronics.
2) Understand SCR"s, MOSFET, UJT, IGBT, Concept of rectification, inversion and commutation

Course Outcome

Students will be able to

1) Demonstrate the learnings of various power semiconductor devices with their protection and apply them for various applications.
2) Analyse different Power Electronics Converter circuits and choose them for suitable applications.
3) Demonstrate the knowledge of chopper circuits, analyse and utilise them for different applications.
4) Analyse inverter circuits with different modulation techniques and identify their application

S.N	TITLE
1	To show V-I characteristics of SCR and measure holding and latching current of SCR.
2	To estimate sensitivity of four modes operation of TRIAC
3	To evaluate average dc voltage of single phase half wave rectifier with Resistive load.
4	To show transfer and output characteristics of Power MOSFET.
5	To show speed control of DC Shunt Motor with Semi Converter.
6	To demonstrate single phase step down Cycloconverter with Resistive load.
7	To demonstrate Forced Commutation methods of SCR.
8	To evaluate RMS AC Voltage of single phase MOSFET based full Bridge inverter.

VI Semester

ELM111	Electric Vehicles			L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
*Best Two out of three MSE's would be considered	15	15	15	30	40	100	3 Hrs
Prerequisites							

Course Objective

1. To verify the impact of electric vehicle on the environment
2. To study the vehicle dynamics and Energy storage systems
3. To analyze the performance of conventional hybrid powertrains
4. To identify the size of machines and the allied power electronics converter

Course Outcome

Students will be able to

a) Understand the emission regulations and standards, drive cycles
b) Analyze the parameters involved in vehicle dynamics and energy storage systems
c) Understand the importance of hybrid electric vehicles
d) Select electric drive and suitable power electronic converter

UNIT I : Electromobility and the Environment

Introduction of IC Engines,History of Electric Powertrain, History of Electric Car, Growing of Electric Powertrain, Energy sources of propulsion and emissions, carbon emission of fuels, Regulations of emissions, Impact of greenhouse gases, Heavy duty Vehicle Regulations, Drive cycles, Battery Electric Vehicle (BEV), fuel consumption, range and miles per gallon or equivalent (MPGe), Environmental Protection Agency (EPA) drive cycles, overview of conventional, battery, hybrid and fuel cell electric system

UNIT II : Vehicle Dynamics

Vehicle load forces, basic power, energy and speed relationships, aerodynamic drag and fuel consumption (numerical), rolling resistance (numerical), vehicle road-load coefficients, gradability, downgrade force and regenerative braking (numerical), vehicle acceleration, traction motor characteristics.

BLDC Motor

Equivalent circuit, forward and reverse mode operation of permanent magnet direct current (PMDC) machine (numerical), power loss and efficiency (numerical), maximum speed using PMDC (numerical).

UNIT III : Energy Storage Systems

Battery

Introduction to batteries, types and battery packs, operation and capacity rate (numerical), battery parameters and comparisons (numerical), battery size of BEV and Hybrid Electric Vehicle (HEV), (numerical), battery protection and management system, battery charging and discharging (numerical), operating curves.

Fuel Cells

Introduction, emission regulations, no-load and on-load voltages, full-load power and efficiency, characteristic curves, size of fuel cell (numerical), boost DC-DC converter, fuel economy of fuel cell electric vehicle (numerical).

UNIT IV : **Conventional Hybrid Powertrains**

Introduction to HEVs, brake specific fuel consumption (numerical), compare conventional, series, series-parallel hybrid system, fuel economy of series and series-parallel HEVs (numerical), use of planetary gear

UNIT V: Traction Machine

Four Quadrant operation, rated parameters (numerical), characteristic curves, constant torque and power mode, maximum speed mode.

UNIT VI: Induction Machine and DC-DC Converter

Induction Machine

Magnetic field and flux density, space vector current and rotating magnetic field, machine model and steady state operation, motoring at rated speed using induction machine (numerical), variable speed operation, stall and start-up using induction machine (numerical), various tests (DC resistance, locked rotor and No-load test).

DC-DC Converter

Introduction, power conversion, basic topology, half-bridge buck-boost bidirectional converter and buck converter, buck converter in continuous conduction mode (CCM) and discontinuous conduction mode (DCM) operation (numerical), conduction losses of IGBT and diode, capacitor sizing (numerical), two-phase interleaved boost converter (numerical).

Text Books:

	Title	Edition	Author	Publisher
1	Electric Powertrain-Energy Systems, Power Electronics and Drives for Hybrid, Electric and Fuel Cell Vehicles	2018	John G. Hayes	John Wiley & Sons

VI Semester

ELM112	Electrical Drives			L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
*Best Two out of three MSE's would be considered	15	15	15	30	40	100	3 Hrs
Prerequisites							

Course Objective:

1. After studying Electrical machines this subject elaborates applications of different machines in industry.
2. Characteristics under starting, running braking and speed control of different motors are explained. Programmable logic controller, contactors, tractions is also explained.

Course Outcome

Students will be able to

1) Classify and compare characteristics of AC and DC motors to interpret application of motors in electrical drives.
2) Apply Selection criteria for electrical drives by adapting electrical and mechanical characteristics of motor.
3) Categorize and compare contactors and relays for application of control circuit.
4) Explain the applications of PLCs in electrical drives and compare and assess control of electrical drive.
5)Estimate and adapt different motors for traction work.

UNIT I : Introduction to Drives and Speed Control

Definition of a Drive, Classification of Drives, Brief idea about drives commonly used in industries, Types of Electrical braking, Speed Control of AC and DC motors.

UNIT II : Selection of motors

Selection of motors and bearings of motor: Power, Flywheel effect, Duty cycles of motor, transmission, enclosure systems for drives.

UNIT III : AC and DC contactor and relays

AC and DC contactor and relays: Limit Switches, magnetic structure, operation, control circuit for automatic starting and braking of DC motor and three phase induction motor

UNIT IV : Programmable Logic Controllers

Programmable Logic Controllers (PLC), programming methods, Ladder programming with few

examples, Applications of PLC's.

UNIT V: Traction motors

Traction motors: Motors in AC/DC traction and their performance and desirable characteristics, Speed time characteristics of train,. Series parallel control, Starting and braking of traction motor.

UNIT VI: Digital speed control of Electric motors

Digital speed control of Electric motors, comparison with Analog method of speed control, Block Diagram arrangement for microprocessor based speed control of AC/DC motor, Flowcharts and algorithms for speed control and speed reversal of motor. Energy conservation in Electrical Drives

Text Books:

S.N	TITLE	EDITION	AUTHOR	PUBLICATION
1	A Course in Electrical Power	1st-2005	Soni, Gupta, Bhatnagar	Dhanpat Rai and Company
2	Magnetic control of motors	Industrial New York 1947	Heumann	Chapman and Hall
3	Introduction to Programmable Logic Controllers	3rd Edition, 2008.	Gary Dunning	Cengage Learning

Reference books:

S.N	TITLE	EDITION	AUTHOR	PUBLICATION
1	Modern Electric Traction	**4th -2005**	H. Pratap	DhanpatRai and Company
2	Modern utilization of traction motor	2003	J.B. Gupta	
3	A Textbook of Electrical Technology Volume III Transmission, Distribution, Utilization		B.L.Theraja, A.K.Theraja	S.Chand

VI Semester

ELM113	Lab: Electrical Drives				L= 0	T = 0	P = 2	Credits = 1
Evaluation Scheme	MSPA 1	MSPA 2	MSPA 3	MSPA 4	TA*	ESE	Total	ESE Duration
	--	--	--	--	60	40	100	
Prerequisites								

Course Objective:

1. After studying Electrical machines this subject elaborates applications of different machines in industry.
2. Characteristics under starting, running braking and speed control of different motors are explained. Programmable logic controller, contactors, tractions is also explained.

Course Outcome

Students will be able to

1. Evaluate and explain different types of starter and their working
2. Categorize different types AC and DC contactor
3. Explain different types limit switch, sensor
4. To design ladder programming in PLC

S.N	Name of Experiment
1	To evaluate and explain the control circuit of star delta starter.
2	To evaluate and explain control circuit of direct online starter (DOL)
3	To explain function of side rotary limit switch.
4	To categorize different types contactors.
5	To classify and explain programming logic control (PLC) M-1200, M-1400 and LOG PLC.
6	To make use of operating limit switch to turn ON contactor (output device).
7	To design ladder programming in PLC to control lamp.
8	To design ladder programming using LOGO PLC to control lamp.
9	To explain Implementation of timer using LOGO PLC.
10	To design ladder programming in PLC to Control of lamps in pre defined sequence.
11	To design a program for Reversal of synchronous motor using PLC
12	To make use of limit switch, and sensors to turn ON contactor motor, lamp.

VII Semester

ELM121	Energy Storage Systems			L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme *Best Two out of three MSE's would be considered	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
	15	15	15	30	40	100	3 Hrs
Prerequisites							

Course Objective:

- To enable students to explore about energy storage systems, its advancements and its applications.
- To Acquire knowledge pertaining to various ways to store energy, its analysis and use.

Course Outcome

Students will be able to

1. Describe the functions of energy storages, their sizing, and applications.
2. Explain electrochemical and mechanical energy storage.
3. Analyse the function and use of flywheel, fuel cells storage.
4. Illustrate battery hybridization, recycling, battery management systems=

UNIT I : Introduction to Energy Storage for Power Systems: Role of energy storage systems, applications. Overview of energy storage technologies: Thermal, Mechanical, Chemical, Electrochemical, Electrical. Efficiency of energy storage systems. Storage in the Fuel Distribution System

UNIT II : Energy storage in electric vehicles: Classification of ES systems, Mechanical Energy storage, Hybrid storage systems for vehicles, issues and challenges

UNIT III : Electromagnetic Energy Storage: Introduction, Energy storage in capacitors, electrochemical charge storage mechanisms. Transient behaviour of a capacitor modelling, super capacitor technology.

UNIT IV :

Battery Energy Storage System: Fundamental concept of batteries, battery performance, charging and discharging of a battery, storage density, energy density, and safety issues Components of a Battery Energy Storage System, Battery Chemistry, : Low power and High-power Batteries, battery charging : constant voltage and constant current;

UNIT V: Thermo-electricity, Thermo electric generators, Fuel cell, Use of power electronic converters in energy storage
UNIT VI: Energy storage systems supporting grid power and transportation, Hybrid systems, flywheel storage.

Text Books:

	Title	Edition	Author	Publisher
1	Energy storage	Vol. 406.	Huggins, Robert Alan	New York: Springer, 2010
2	Energy Storage for Power Systems		Ter-Gazarian	Institution of Engineering and Technology, 1994.

*In Laboratory courses TA=MSPA 1+MSPA 2+MSPA 3+MSPA 4= 60 marks

YESHWANTRAO CHAVAN COLLEGE OF ENGINEERING
(An Autonomous Institution affiliated to R T M Nagpur University Nagpur)
Accredited by NAAC (1st Cycle) with 'A' Grade (Score 3.25 on 4 Point Scale)
Wanadongri, Hingna Road, Nagpur-441110

Department of Electronics Engineering
(Minor in IoT)

B.E. Minor in Internet of Things
SoE & Syllabus 2022-23

B.E Minor in Internet of Things

Information Brochure of Minor Program

1. **Title of the Program: B.E Minor in Internet of Things**
2. **Type of Program: Minor**
3. **Department offering the program: Electronics Engineering**
4. **Industry Collaboration: Adept Embedded Solutions Pvt Ltd., Nagpur**
5. **Department/s eligible to opt for the program:**

   The students from **CE**, **EL, ME, CT and IT** are eligible to opt for this program. *Department of Electronics Engineering and Department of Electronics & Telecommunication Engineering students are not permitted to opt for the program.*

6. **General information about courses in program:**

   This course will provide students with the ability to understand the concepts of Internet of Things. In contrast to maximum other industries, it'd be incorrect to discover IoT as an entire enterprise by itself, with it's own specialization in terms of mastering. Yet, one of the first things that come to a student's mind whilst selecting IoT careers path is the qualification and specialization needed for it. From that attitude, those are in particular the one of a kind verticals that one could put together for almost every area, device, sensor, software, etc are connected to each other. The ability to access these devices through a smart phone or through a computer is called IoT. These devices are accessed from a distance. The entire process starts with the devices themselves, such as smart phones, digital watches, electronic appliances that securely communicate with an internet of things platform. IoT platform collects and combines data from multiple devices and platforms and applies analytics to share the most valuable data with applications to address industry-specific needs. Several Communication Protocols and Technology used in the internet of Things. Some of the major IoT technology and protocol (IoT Communication Protocols) are Bluetooth, Wifi, Radio Protocols, LTE-A, and Wi Fi-Direct. These IoT communication protocols cater to and meet the specific functional requirement of an IoT system. The Internet of Things is transforming our physical world into a complex and dynamic system of connected devices on an unprecedented scale. Advances in technology are making possible a more widespread adoption of IoT, from pill-shaped micro-cameras that can pinpoint thousands of images within the body, to smart sensors that can assess crop conditions on a farm, to the smart home devices that are becoming increasingly popular.

7. **Advance knowledge or research orientation of Program:**

   This course introduces to the concepts and techniques of IoT applications. The Internet of Things connects digital data to the physical world. Through this network, items like fitness trackers and alarm systems use embedded sensors to exchange information with each other. Because of the IoT, your Fit Bit can track and store information about your health in a profile, and your doorbell alarm can keep surveillance video in the cloud. Devices within the IoT are often called "smart," like smart locks that you can engage with the tap of a button in an app. In addition to these daily applications, IoT devices

have been designed to meet specific industrial needs. These include pressure sensors on oil and gas pipelines that allow for remote monitoring, moisture sensors that track water levels, and even drone technology that provides information for data-based decision making. The Internet of Things (IoT) is expanding at a rapid rate, and it is becoming increasingly important for professionals to understand what it is, how it works, and how to harness its power to improve business. This introductory course will enable learners to leverage their business and/or technical knowledge across IoT-related functions in the workplace. In the course, we will examine the concept of IoT. We will look at the 'things' that make up the Internet of Things, including how those components are connected together, how they communicate, and how they value add to the data generated. We will also examine information security and privacy issues, and highlight how IoT can optimize processes and improve efficiencies in your business.

8. Employability potential of program:

With the development in electronic gadgets, higher technology like utilities, the Internet of Things offers a wide range of career opportunities in embedded systems cyber security (a particularly hot market), software development, and more. Some of the top IoT industries are healthcare, manufacturing, utilities, transportation, agriculture, and consumer products. Jobs are expected to increase in the coming years across industries, though growth may be slower in some sectors than others. "In some areas, it's definitely going to flourish, and in other areas, it might be slow and run into issues with things like security and privacy.

9. Departmental Steering committee: For proper publicity / conduct of program

SN	Name of the Faculty Member	Post	Designation	e-mail ID	Contact Number
1	Dr. P. T. Karule	Chairman	Prof. & Head	ptkarule@gmail.com	9764996490
2	Dr. S. V. Rathkanthiwar	Member	Professor	svr_1967@yahoo.com	9764996797
3	Dr. A. S. Khobragade	Member	Professor	atish_khobragade@rediffmail.com	9765005110
4	Dr. R. D. Thakre	Member	Professor	rdt2909@gmail.com	9423603236

10. Program Coordinator:

SN	Name of the Faculty Member	Post	Designation	e-mail ID	Contact Number
1	Vilas Alagdive	Coordinator	Asst.Professor	vilas_a23@rediffmail.com	7768842506

Scheme of Examination
Minors in Internet of Things

SN	Sem	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
					L	T	P	Hrs		MSEs*	TA**	ESE	
1	5	EEM101	Microcontroller & its Applications	T	3	0	0	3	3	30	30	40	3 Hours
2	5	EEM102	Lab: Microcontroller & its Applications	P	0	0	2	2	1		60	40	
3	5	EEM103	Wireless sensor networks	T	3	0	0	3	3	30	30	40	3 Hours
4	6	EEM111	Internet of Things	T	3	0	0	3	3	30	30	40	3 Hours
5	6	EEM112	Lab: Internet of Things	P	0	0	2	2	1		60	40	
6	6	EEM113	Information Security	T	3	0	0	3	3	30	30	40	3 Hours
7	7	EEM121	Machine Learning	T	3	0	0	3	3	30	30	40	3 Hours
8	7	EEM122	Lab: Machine Learning	P	0	0	2	2	1		60	40	
TOTAL					**15**	**0**	**6**	**21**	**18**				

MSEs* = Three MSEs of 15 Marks each will conducted and marks of better 2 of these 3 MSEs will be considered for Continuous Assessment

TA ** = for Theory : 20 marks on lecture quizzes, 8 marks on assignments, 2 marks on class performance
TA = for Practical : MSPA will be 15 marks each**

5 Semester

EEM101	**Microntroller and Applications**			L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
*Best Two out of three MSE's would be considered	15	15	15	30	40	100	3 Hrs
Prerequisites							

Course Objective

Students should be able to

1. Provide the acquaintance with concepts of inbuilt memory,I/O Ports ,timer, serial communication using 8051
2. To develop the 8051 based projects

Course Outcome

Students will be able to

1. Understand & Learn concept of Architecture of 8051 µc
2. Apply the concept of programming language to interface I/O Devices
3. Establish the serial communication between the I/O Devices.
4. Design Data Acquisition System related to Industries

UNIT I :

Overview of 8051 Microcontroller family, Introduction to MCS 51 family, Architecture, Memory organization, Internal RAM, Flag Register, Register Banks, SFRs , Functional pin description and various resources of MCS 51, Hardware Overview, Addressing modes, Instruction set and Assembly language programming Programs using look up table.

UNIT II :

Loop, Jump and Call instructions, Bit manipulation, 8051 I/O programming, Delay Programs. I/O Interfacing such as LED, switches, 7 segment display.

UNIT III :

8051 programming in C: Data types and time delay, I/O programming, Logic operations, Data conversion programs, Lookup table access, Timer programming in assembly and C: Various modes of operation, SFR related to timer operation.

UNIT IV :

Serial Port programming in assembly and C: Basics of serial communication, 8051 connection to RS 232. Serial data transfer programs. 8051 interrupts, Interrupts programming in assembly and C, programming timer interrupt, external interrupt, serial interrupt.

UNIT V: Interfacing and programming for LCD, Interfacing RTC using I2C Bus and programming.
UNIT VI: Interfacing of ADC, DAC, stepper motor and DC Motor

Text Books:				
	Title	**Edition**	**Author**	**Publisher**
1	The 8051 Microcontroller and Embedded systems	2nd edition	Muhammad Ali Mazidi , J.G. Mazidi	Pearson Education, Prentice Hall of India.
2	The 8051 Microcontroller Architecture, programming and Applications	2nd edition	Kenneth Ayala	Penram India publication.
Reference Book:				
	Title	**Edition**	**Author**	**Publisher**
1	Advanced Microprocessors and Peripherals	2nd edition	A. K. Ray, K. M. Bhurchandi	Tata McGraw Hill

5th Semester

EEM102	Lab: Microntroller and Applications			L= 0	T = 0	P = 1	Credits = 1
Evaluation Scheme	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
*Best Two out of three MSE's would be considered	--	--	--	60	40	100	3 Hrs
Prerequisites							

Course Objective

Students should be able to

1. Provide the acquaintance with concepts of inbuilt memory,I/O Ports ,timer, serial communication using 8051
2. To develop the 8051 based projects

Course Outcome

Students will be able to

1. Understand & Learn concept of Architecture of 8051 µc
2. Apply the concept of programming language to interface I/O Devices
3. Establish the serial communication between the I/O Devices.
4. Design Data Acquisition System related to Industries

Exp No	Name of Experiment
1	Add data bytes in an internal RAM.
2	Convert single digit Hex number to its ASCII equivalent
3	Find the maximum data byte in a block
4	Data block transfer.
5	Find three numbers of negative data bytes in a block.
6	Convert BCD to its binary equivalent.
7	Generate a saw tooth waveform using DAC.
8	Read Analog signal from channel 2 of ADC and store it to internal RAM.
9	Rotate stepper motor into clockwise and counter clockwise direction
10	Generate square waveform from pin no P 1.2 of 8051
11	Display character on LCD.

Text Books:				
	Title	**Edition**	**Author**	**Publisher**
1	The 8051 Microcontroller and Embedded systems	2nd edition	Muhammad Ali Mazidi , J.G. Mazidi	Pearson Education, Prentice Hall of India.
2	The 8051 Microcontroller Architecture, programming and Applications	2nd edition	Kenneth Ayala	Penram India publication.
Reference Book:				
	Title	**Edition**	**Author**	**Publisher**
1	Advanced Microprocessors and Peripherals	2nd edition	A. K. Ray, K. M. Bhurchandi	Tata McGraw Hill

5th Semester

EEM103	Wireless Sensor Networks			L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme *Best Two out of three MSE's would be considered	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
	15	15	15	30	40	100	3 Hrs
Prerequisites							

Course Objective

Students should be able to

1. Provide an overview about sensor networks and emerging technologies.

Course Outcome

Students will be able to

1. Design wireless sensor networks for a given application
2. Understand emerging research areas in the field of sensor networks
3. Understand MAC protocols used for different communication standards used in WSN
4. Explore new protocols for WSN

UNIT I :

Introduction to Sensor Networks, unique constraints and challenges, Advantage of Sensor Networks, Applications of Sensor Networks, Types of wireless sensor networks

UNIT II :

Mobile Ad-hoc Networks (MANETs) and Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks. Issues and challenges in wireless sensor networks

UNIT III :

Routing protocols, MAC protocols: Classification of MAC Protocols, S-MAC Protocol, B-MAC protocol, IEEE 802.15.4 standard and ZigBee,

UNIT IV :

Dissemination protocol for large sensor network. Data dissemination, data gathering, and data fusion; Quality of a sensor network; Real-time traffic support and security protocols.

UNIT V:

Design Principles for WSNs, Gateway Concepts Need for gateway, WSN to Internet Communication, and Internet to WSN Communication.

UNIT VI:

Single-node architecture, Hardware components & design constraints, Operating systems and execution environments, introduction to TinyOS and nesC.

Text Books:				
	Title	**Edition**	**Author**	**Publisher**
1	Wireless Sensor Networks Theory And Practice	2nd Edition	WaltenegusDargie , Christian Poellabauer	John Wiley & Sons Publications
2	Sensors Handbook		Sabrie Soloman	McGraw Hill publication
Reference Book:				
	Title	**Edition**	**Author**	**Publisher**
1	Wireless Sensor Networks	2nd Edition 2004	Feng Zhao, Leonidas Guibas	Elsevier Publications
2	TinyOS Programming	2nd Edition 2009	Philip Levis, And David Gay	Cambridge University Press 2009

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

Department of Electronics Engineering

B.E Minor in Internet of Things

SoE No. MIN-101

6th Semester

EEM111	**Internet of Things**			L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
*Best Two out of three MSE's would be considered	15	15	15	30	40	100	3 Hrs
Prerequisites							

Course Objective

Students should be able to

1. Get acquainted with various IOT environments.
2. Study IOT architecture and its enabling technologies.
3. Acquire hands on laboratory experience, utilizing IOT kit.

Course Outcome

Students will be able to

1. Understanding of IoT value chain structure (device, data cloud), application areas and technologies involved
2. Understand IoT sensors and technological challenges faced by IoT devices, with a focus on wireless, energy, power, RF and sensing modules
3. Market forecast for IoT devices with a focus on sensors
4. Explore and learn about Internet of Things with the help of preparing projects designed for Raspberry Pi

UNIT I : Introduction

Internet of Things Promises–Definition–Scope–Sensors for IoT Applications–Structure of IoT–IoT Map Device

UNIT II : Seven Generations of IOT Sensors

Industrial sensors –Description & Characteristics–First Generation –Description & Characteristics–Advanced Generation –Description & Characteristics–Integrated IoT Sensors –Description & Characteristics–Polytronics Systems –Description & Characteristics–Sensors' Swarm –Description & Characteristics–Printed Electronics –Description & Characteristics–IoT Generation Roadmap

UNIT III : Technological Analysis

Wireless Sensor Structure–Energy Storage Module–Power Management Module–RF Module–Sensing Module

UNIT IV : IOT Development Examples

ACOEM Eagle –EnOcean Push Button –NEST Sensor –Ninja Blocks -Focus on Wearable Electronics

UNIT V: Creating Sensor Projects

Creating the sensor project -Preparing Raspberry Pi -Cluster libraries -Hardware-Interacting with the hardware -Interfacing the hardware-Internal representation of sensor values -Persisting data -External representation of sensor values -Exporting sensor data -Creating the actuator project

UNIT VI: Preparing IoT Projects

Hardware -Interfacing the hardware -Creating a controller -Representing sensor values -Parsing sensor data -Calculating control states -Creating a camera -Hardware -Accessing the serial port on Raspberry Pi -Interfacing the hardware -Creating persistent default settings -Adding configurable properties -Persisting the settings -Working with the current settings -Initializing the camera

Text Books:

	Title	Edition	Author	Publisher
1	'Technologies & Sensors for the Internet of Things Businesses & Market Trends 2014 - 2024'	II edition	Dr. Guillaume Girardin , Antoine Bonnabel, Dr. Eric Mounier	1. Yole Développement Copyrights ,2014
2	Sensors, Actuators and Their Interfaces	II edition	N. Ida	Scitech Publishers, 2014

Reference Book:

	Title	Edition	Author	Publisher
1	'Learning Internet of Things'	II edition	Peter Waher	Packt Publishing, 2015

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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Department of Electronics Engineering

B.E Minor in Internet of Things

SoE No. MIN-101

6th Semester

EEM112	**Lab: Internet of Things**			L= 0	T = 0	P = 1	Credits = 1
Evaluation Scheme	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
*Best Two out of three MSE's would be considered	--	--	--	60	40	100	3 Hrs
Prerequisites							

Course Objective

Students should be able to

1. Get acquainted with various IOT environments.
2. Study IOT architecture and its enabling technologies.
3. Acquire hands on laboratory experience, utilizing IOT kit.

Course Outcome

Students will be able to

1. Understanding of IoT value chain structure (device, data cloud), application areas and technologies involved
2. Understand IoT sensors and technological challenges faced by IoT devices, with a focus on wireless, energy, power, RF and sensing modules
3. Market forecast for IoT devices with a focus on sensors
4. Explore and learn about Internet of Things with the help of preparing projects designed for Raspberry Pi

Exp No	Name of Experiment
1	Define and Explain Eclipse IoT Project.
2	List and summarize few Eclipse IoT Projects
3	Sketch the architecture of IoT Toolkit and explain each entity in brief
4	Demonstrate a smart object API gateway service reference implementationinIoT toolkit
5	Write and explain working of an HTTP-to-CoAP semantic mapping proxyinIoT toolkit
6	Describe gateway-as-a-service deploymentinIoT toolkit
7	Explain application framework and embedded software agents for IoT toolkit
8	Explain working of Raspberry Pi
9	Connect Raspberry Piwith your existing system components
10	Give overview of Zetta

Text Books:				
	Title	**Edition**	**Author**	**Publisher**
1	'Technologies & Sensors for the Internet of Things Businesses & Market Trends 2014 - 2024'		Dr. Guillaume Girardin , Antoine Bonnabel, Dr. Eric Mounier	Yole Développement Copyrights ,2014
2	Sensors, Actuators and Their Interfaces		N. Ida	Scitech Publishers, 2014
Reference Book:				
	Title	**Edition**	**Author**	**Publisher**
1	'Learning Internet of Things'		Peter Waher	Packt Publishing, 2015

6th Semester

EEM113	Information Security			L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
*Best Two out of three MSE's would be considered	15	15	15	30	40	100	3 Hrs
Prerequisites							

Course Objective

Students should be able to

1. Introduce cryptography theories, algorithms, and systems. It will alsoconsider necessary approaches and techniques to build protection mechanisms in order to secure computer networks.

Course Outcome

Students will be able to

1. Learn threats to computer networks and protection mechanisms and methods need to thwart these threats.
2. Understand the theory of fundamental cryptography, encryption, and decryption algorithms,
3. Build simple cryptosystems by applying encryption algorithms,
4. Comprehend secure identity management (authentication), message authentication, and digital signature techniques.

UNIT I :

Security Goals,Cryptographic Attacks, Services & Mechanisms, Techniques, Mathematics of Cryptography, Traditional Symmetric Key Ciphers.

UNIT II :

Mathematics of Symmetric Key Cryptography, Algebraic Structures, GF(2n) Fields, Introduction to Modern Key Ciphers , Modern Block Ciphers, Modern Stream Ciphers.

UNIT III :

Data Encryption Standard (DES) , DES Structure, DES Analysis, Security of DES, Multiple DES, Examples of Block Cipers Influenced by DES, Advanced Encryption Standard, Transformation , Key Expansion , AES Ciphers, Analysis of AES.

UNIT IV :

Mathematics of Asymmetric-Key Cryptography , Primes , Primality Testing, Factorization, Chinese's Remainder Theorem, Quadratic Congruence, Exponentiation & Logarithmic.

UNIT V:

Asymmetric – Key Cryptography , RSA Cryptography , Rabin Cryptosystem, ElGamal Cryptosystem, Elliptic Curve Cryptosystem

UNIT VI:

Message Authentication and Hash Functions, Digital Signatures and Key Management. IP Security: Architecture, Authentication header, Encapsulating security payloads, Web Security: Secure socket layer and transport layer security, secure electronic transaction (SET).System Security: Intruders, Viruses and related threads, firewall design principals, trusted systems.

Text Books:

	Title	Edition	Author	Publisher
1	Cryptography and Network Security	Second Edition	William Stallings	Pearson Education Asia
2	Cryptography and Network Security	Second Edition	Behrouz A. Forouzan	Mcgraw-Hill

Reference Book:

	Title	Edition	Author	Publisher
1				

7th Semester

EEM121	Machine Learning			L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
*Best Two out of three MSE's would be considered	15	15	15	30	40	100	3 Hrs
Prerequisites							

Course Objective

Students should be able to

1. The basic concepts of machine learning and the relative strengths and weaknesses of different machine learning methods.
2. To understand the concepts of different types of machine learning algorithms and how to apply a learning algorithms to sample.
3. To understand the different methods of evaluation of machine learning algorithms
4. To understand different ensembling methods and new techniques like ddep and shallow learning.

Course Outcome

Students will be able to

1. develop an appreciation for what is involved in learning from data, machine learning techniques that are suitable for the different applications
2. design an appropriate learning model from set of samples to meet the desired needs
3. compare different machine learning techniques and demonstrate the comprehension of the trade-offs involved in design choices
4. integrate machine learning algorithms with ensembling methods and explain modern technologies like deep and shallow learning

UNIT I :

Introduction to machine learning. Introduction, machine learning classes (i.e., supervised, unsupervised and reinforced), well posed and ill posed learning problems, designing a learning system, perspective and issues in machine learning, applications

UNIT II :

Supervised Learning: Learning a class from Bayesian learning, learning theory (bias/variance tradeoffs; VC theory; large margins), Generative/discriminative learning, parametric/non-parametric learning, linear and logistic regression, SVM

UNIT III :

Unsupervised Learning: Introduction, Density Estimation, Clustering, Dimensionality reduction, PCA, kernel methods

UNIT IV : Decision Tree Learning: Introduction, decision tree representation, appropriate problems for Decision Tree learning,the basics decision tree learning algorithm, hypothesis space search, inductive bias in decision tree learning, issues in decision tree learning.
UNIT V: Design and Analysis of Machine Learning Algorithms.Introduction, Factors, Response, and Strategy of Experimentation, Guidelines for Machine Learning experiments, Cross-Validation and Resampling Method, Measuring Classifier Performance, Interval Estimation, Hypothesis Testing.
UNIT VI: Advance Topics. Ensemble methods, Introduce the concepts behind deep learning and benefits of deep over shallow networks, introduce the concepts of reinforcement learning.

Text Books:

	Title	Edition	Author	Publisher
1	Introduction to Machine Learning	second edition	EthemAlpaydin	MIT Press
2	Machine Learning		Tom Mitchell	McGraw-Hill Science/Engineering/Math, 1997

Reference Book:

	Title	Edition	Author	Publisher
1	Pattern Recognition and Machine Learning		Christopher M. Bishop	

7th Semester

EEM122	Lab: Machine Learning			L= 0	T = 0	P = 1	Credits = 1
Evaluation Scheme	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
*Best Two out of three MSE's would be considered	--	--	--	60	40	100	3 Hrs
Prerequisites							

Course Objective

Students should be able to

1. The basic concepts of machine learning and the relative strengths and weaknesses of different machine learning methods.
2. To understand the concepts of different types of machine learning algorithms and how to apply a learning algorithms to sample.
3. To understand the different methods of evaluation of machine learning algorithms
4. To understand different ensembling methods and new techniques like ddep and shallow learning.

Course Outcome

Students will be able to

1. develop an appreciation for what is involved in learning from data, machine learning techniques that are suitable for the different applications
2. design an appropriate learning model from set of samples to meet the desired needs
3. compare different machine learning techniques and demonstrate the comprehension of the trade-offs involved in design choices
4. integrate machine learning algorithms with ensembling methods and explain modern technologies like deep and shallow learning

Exp No	Name of Experiment
1	Regression
2	Bayes Rule
3	KNN
4	Clustering
5	Decision Tree
6	SVM
7	Evaluation of ML algorithms using RECALL
8	Evaluation of ML algorithms using Precision
9	Evaluation of ML algorithms using Accuracy
10	Evaluation of ML algorithms using FScore

Text Books:				
	Title	**Edition**	**Author**	**Publisher**
1	Introduction to Machine Learning	second edition	EthemAlpaydin	MIT Press
2	Machine Learning		Tom Mitchell	McGraw-Hill Science/Engineering/Math, 1997
Reference Book:				
	Title	**Edition**	**Author**	**Publisher**
1	Pattern Recognition and Machine Learning		Christopher M. Bishop	

YESHWANTRAO CHAVAN COLLEGE OF ENGINEERING
(An Autonomous Institution affiliated to R T M Nagpur University Nagpur)
Accredited by NAAC (1st Cycle) with 'A' Grade (Score 3.25 on 4 Point Scale)
Wanadongri, Hingna Road, Nagpur-441110

Department of Electronics & Communications Engineering (Minor in DSP&ES)

B.E. Minor in DSP and Embedded System SoE & Syllabus 2022-23

B.E Minor in DSP and Embedded System

Information Brochure of Minor Program

1. Title of Program: **DSP and Embedded System**

2. Type of Program : **Minor**

3. Department offering the program: **Department of Electronics & Telecommunication Engineering**

4. Industry Collaboration: **First Impression Technology Ltd,Nagpur**

5. Department/s eligible to opt for the program:

The students from **CE, EL, ME, CT, IT, CSE** are eligible to opt for this program. *Department of Electronics Engineering and Electronics & Telecommunication Engineering students are not permitted to opt for the program.*

6. General information about courses in program: (250 words)

- In today's world embedded systems are very important and have applications in almost all fields of engineering. With the addition of "Digital Signal processing" (DSP) the human world has changed significantly finding its applications in automotive industry, consumer electronics, medical devices, defence and many.
- It is necessary for any graduating engineer to know fundamental principles of designing embedded systems and digital signal processing.
- The programme emphasizes the key aspects of both hardware and software of microcontrollers and their integration for development of real time applications. It introduces students to understand the process of development of embedded systems, from specifications to final marketable products.
- It exposes students to fundamentals of controllers, sensors and actuators used in embedded systems, various aspects of the design and development of hardware and software in an

embedded system, and basics of DSP. In the process they are expected to use knowledge and apply skills gained in their domain of engineering.

7. Employability potential of program:

The Program DSP and Embedded System teach the combination of customized hardware and software to carry out a specific set of tasks. We benefit from many embedded systems daily in our cars, medical devices, consumer electronics, and smart home appliances.

- Embedded System is the future. Every industry needs some artificial intelligence into it and artificial intelligence can be given by DSP & embedded systems only. No electronic product is without embedded systems in the market.
- Lot of career opportunities are available in DSP and embedded systems. Some of them are Embedded Software Engineer, System Software Engineer, Software Test Engineer. Embedded Hardware Engineer

8. Departmental Steering committee: For proper publicity / conduct of program

SN	Name of the Faculty Member	Post	Designation	e-mail ID	Contact Number
1	Dr. M. S. Narlawar	HoD	Chairman BoS	hod_et@ycce.edu	9763822298
2	Dr. M.S. Dorle	Assistant Professor	Co-ordinator	mdorle@gmail,com	9881711748
3	Prof.K.P.Kamble	Assistant Professor	Member	kanchan_114@rediffmail.com	9422844074
4	Prof.S.A.Desai	Assistant Professor	Member	sad.ycce@gmail.com	9665759319

10. Program Coordinator:

SN	Name of the Faculty Member	Post	Designation	e-mail ID	Contact Number
1	Dr. M.S. Dorle	Assistant Professor	Co-ordinator	mdorle@gmail,com	9881711748

Scheme of Examinations
B.E Minor in DSP and Embedded System

SN	Sem	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
					L	T	P	Hrs		MSEs*	TA**	ESE	
1	5	ETM101	Analog Electronics	T	3	0	0	3	3	30	30	40	3
2	5	ETM102	Digital Circuts and Fundamentals of Microprocessors	T	3	0	0	3	3	30	30	40	3
3	5	ETM103	Analog and Digital Electronics Lab	p	0	0	1	2	1		60	40	3
4	6	ETM111	Embedded System	T	3	0	0	3	3	30	30	40	3
5	6	ETM112	Digital Signal Processing	T	3	0	0	3	3	30	30	40	3
6	6	ETM113	Simulation Lab	P	0	0	1	2	1		60	40	3
7	7	ETM121	Analog and Digital Communication	T	3	0	0	3	3	30	30	40	3
8	7	ETM123	Analog and Digital Communication Lab	P	0	0	1	2	1		60	40	3
				TOTAL	**15**	**0**	**3**		**18**	**18**			

MSEs* = Three MSEs of 15 Marks each will conducted and marks of better 2 of these 3 MSEs will be considered for Continuous Assessment

TA ** = for Theory : 20 marks on lecture quizzes, 8 marks on assignments, 2 marks on class performance
TA = for Practical : MSPA will be 15 marks each**

V Semester
ETM101: Analog Electronics

Course Objective	Course Outcome
Students should be able to 1) Understand modern analog circuits using integrated bipolar and field effect transistor technologies. 2) Understand basic principles of analog integrated circuit for analog IC design. 3) Learn operational amplifier basics, its parameters and its applications. 4) Understand Data converters and waveform generators	Students will be able to 1) Understand fundamentals of OP-AMP. 2) Design and parametric analysis of error compensation network. 3) Design and analyze linear and non-linear OP-AMP applications. 4) Explore special function ICs and its applications.

UNIT-1: OPERATIONAL AMPLIFIER FUNDAMENTALS
Basic Op Amp Configurations, Open loop, Ideal Op Amp, Feedback in OPAMP circuit: Inverting, Non inverting, voltage follower. **(06 Hours)**

UNIT-2: OP AMP LIMITATIONS- STATIC and DYNAMIC
OPAMP parameters, Input Bias and Offset Current, Input Bias and Offset voltages, input offset error Compensation, open loop and closed loop Frequency response, Transient response.
(06 Hours)

UNIT-3: LINEAR APPLICATIONS
Summer, difference amplifier, integrator, differentiator, Current-to-Voltage Converter, Voltage-to-Current Converter, Voltage-to-Frequency Converter, Frequency -to-Voltage Converter, Transducer and Instrumentation Amplifier circuits, Industrial applications.
(06 Hours)

UNIT 4: NONLINEAR CIRCUITS
Precision Rectifiers, clipper, clamper, Voltage Comparators, Schmitt Triggers, Sample-and-Hold Circuits, Load Controlling circuits.
WAVEFORM GENERATORS
Sinusoidal Oscillators based on Wein bridge and RC Phase shift and Square wave generation, Triangular wave generator **(06 Hours)**

UNIT-5: ACTIVE FILTERS
Transfer function, first order filter, standard frequency response, KRC Filters with variable gain and Unity Gain, Second order LPF & HPF Butterworth filter design, BPF and BRF **(06 Hours)**

UNIT 6: SPECIAL FUNCTION IC'S
Monolithic timers IC 555, Application circuits based on IC555, D-A Converters (DACs), A- D Converters (ADCs), Linear IC LM324.
(06 Hours)

Text books:				
1	Design with Operational Amplifiers and Analog Integrated Circuits	2002	By Sergio Franco	McGraw-Hill
2	Linear Integrated Circuits	2015	By D. Roy Chaudhari, Shail Jain	New Age International
3	Op-Amps and Linear Integrated Circuits	2015	ByRamakant A. Gayakwad	Pearson
Reference books:				
1.	Linear Integrated Circuits	2010	By S. Salivahanan, V. S. Bhaaskaran	McGraw-Hill

V Semester
ETM102: Digital Circuits and Fundamentals of Microprocessor

Course Learning Objective Students should be able to	Course Outcomes Students will be able to
1. To learn digital logic families and minimization method. 2. Understand the concept of Combinational circuits using MSI and LSI chips 3. To Learn arithmetic circuits 4. To Know Synchronous, and Asynchronous counters and flip flops 5. To Study 8085 Microprocessor. 6. To Study assembly language programming.	1. Simplify Boolean expressions using k-map & tabulations method. 2. Identify, formulate, and solve combinational logic design problems. 3. Understand the concepts of flip-flops, and it's conversion from one flip-flop to another. 4. Design sequential logic circuits. 5. Develop programs for 8085 microprocessor.

Unit - I **[6 Hrs]**
Introduction to Logic families & their characteristics. Fan-In, Fan-out, Propagation delay, Power dissipation, Noise Margin, CMOS inverter. BCD arithmetic, simplification of Boolean expressions, Implementations of Boolean expressions using logic gates, Karnaugh map, Quine McCaskey methods, Formation of switching functions from word statements.

Unit - II **[5 Hrs]**
Functions & implementation using Multiplexer, Demultiplexer, Encoder, Decoder. Combinational circuit analysis, Combinational circuits design using MSI and LSI chips, Code Converters.

Unit - III **[5 Hrs]**
Design of Arithmetic circuits: Half & Full adders, Half & Full subtractors , Multibit parallel adders, Carry Propagate adder & Carry Look ahead adder, BCD Adder, Comparators, Multi bit Application designs, ALU

Unit - IV **[6 Hrs]**
Edge & Level triggers. Need for sequential circuits, Binary cell, Latches and flip-flops. RS-FF, D-FF, JK-FF, Master-Slave JK-FF & T-FF, Excitation & Truth Table, Flip-flop conversions, Shift registers, Synchronous and Asynchronous sequential Circuits. Counters Design, Ring counter.

Unit - V **[7 Hrs]**
Introduction to 8085 Microprocessor-Architecture, Addressing Modes, Instruction set, PIN configuration

Unit - VI **[7 Hrs]**
8085 advanced instructions, Assembly language programming, Interrupts)

Text books:	
1	Digital Design 3rd edition 2007-06-15 M. Morris Mano, Pearson PH
2	Microprocessor Architecture, Programming and Applications with the 8085, Ramesh Gaonkar ,Penram International Publications.
Reference books:	
1	Digital Circuits & Microprocessors 5th edition, 2004 Hebert Taub Mc Graw Hill2
2	Fundamentals of Digital Logic with VHDL Design 2nd Edition, 2007 Stephen Brown & Zvonko Vranesic TMH
3	Engg Approach to Digital Design 1st edition(February 19, 1997)W. Fletcher PHI

V Semester
ETM103: Lab: Analog and Digital Electronics

Course Learning Objective Students should be able to	Course Outcomes Students will be able to
1) Understand basic principles of analog integrated circuit for analog IC design. 2) Learn operational amplifier basics, its parameters and its applications. 3) Understand the concept of Combinational and Sequential circuits. 4) To Study assembly language programming.	1) Design and analyze linear and non- linear OP-AMP applications. 2) Explore special function ICs and its applications 3) Identify, formulate, and solve combinational logic design problems. 4) Design sequential logic circuits. 5) Develop programs for 8085 microprocessor.

Expt. No.	Name of Experiment
1	OP-AMP as a inverting amplifier / non-inverting amplifier with frequency response
2	Study different OPAMP parameters: CMRR, Slew rate of OP-AMP
3	OP-AMP as an Integrator
4	OP-AMP as a Low pass filter
5	Bistable Multivibrator using IC 555
6	Design and Realization of Basic logic gates using Universal gates
7	Design of Adder and Subtractor
8	Design of Flip Flop
9	Design of Shift Resister
10	Design of Counter
11	Write a program to add two 8 bit numbers

VI Semester
ETM111: Embedded System

Course Learning Objective Students should be able to	Course Outcomes Students will be able to
1) To study & understand the detailed architectural features of Arduino IDE Overview 2) To study the Elements of Arduino Board 3) To explore the Arduino programming and types of Arduino Board 4) To understand interfacing of various peripherals with Arduino Board	1) Explore the architectural features of Arduino IDE Overview. 2) Explore various elements of Arduino Board. 3) Develop programs in interfacing of different peripherals with ATMEGA328 P PU. 4) Acquire knowledge about memory management in ATMEGA328 P PU.

UNIT-1 **(06 Hours)**
Introduction To Arduino: Arduino Installation, Arduino IDE Overview, Elements of Arduino Board, Types of Arduino Board, Block diagram of ATMEGA 328 P PU, On-chip flash program memory.

UNIT-2 **(06 Hours)**
Introduction To Arduino Programming: Comments, Variables, Setup Function, Loop Function, Conditional Statements, Arrays, Important Header Files.

UNIT-3 **(06 Hours)**
Introduction to NodeMCU, Insight Into ESP8266 NodeMCU Features & Using It With Arduino IDE, Installing the ESP8266 Core on Windows OS, ESP8266 NodeMCU Pinout, Power requirement, Serial Communication, Peripherals and I/O, Serial Communication.

UNIT-4 **(06 Hours)**
Introduction to ESP 32, Differentiate between NodeMcu with ESP 32, ESP 32 Features & Using It With Arduino IDE, ESP 32 Pinout, Power requirement, Serial Communication, Peripherals and I/O, Serial Communication.

UNIT-5 **(06 Hours)**
Memory Hierarchy, memory size and speed, on-chip memory, caches, cache design, memory management.

UNIT-6: **(06 Hours)**
Arduino Interfacing with peripherals Pin Mode Functions Input and Output In Arduino –LED With Arduino, LCD with Arduino, DC motor – forward and reverse, Ultrasonic Sensor With Arduino, Blinking and Fading an LED Using Arduino. Buzzer With Arduino, PIR Sensor With Arduino, Temperature Sensor With Arduino, Smoke and Gas Sensor in Arduino, Humidity sensor, LDR using Arduino, GPS With Arduino

Text Books:

Exploring Arduino: Tools and Techniques for Engineering Wizardry 2nd Edition	2nd Edition October 24, 2019	by Jeremy Blum	Wiley; 2 edition (October 24, 2019)
Adventures in Arduino 1st Edition	1st Edition May 4, 2015	by Becky Stewart	Wiley; 1st Edition May 4, 2015

Reference Books:

Arduino: A Technical Reference	Publish Date: May 2016	J. M. Hughes	O'Reilly Media, Inc.

VI Semester
ETM112: Digital Signal Processing

Course Learning Objective Students should be able to	Course Outcomes Students will be able to
1) Learn Signals and System. 2) Understand discrete time signal and system 3) Understand z transform and discrete Fourier transform and verify the properties 4) Study the design of IIR and FIR digital filters	1) Differentiate Signals and System and perform sampling of signal. 2) Analyse discrete time signal and system. 3) Apply z transform and discrete Fourier transform and verify the properties. 4) Design and implement digital IIR and FIR filters

Unit I : Signals, Systems and Signal Processing **(6 Hrs)**

Basic Elements of Digital Signal Processing, Advantages, Classification of Signals, Concept of Frequency in Continuous time and Discrete time Signals, Sampling of Analog Signals

Unit II: Discrete Time Signals and Systems **(6 Hrs)**

Elementary Discrete time signals, Classification of Discrete time signals, Input-output Description of System, Block diagram representation of discrete time system, Classification of discrete time system, Response of LTI system: Convolution.

Unit III: Z-transform **(6 Hrs)**

Z-transform, Properties of Z-transform, Rational Z-transform, Inverse z-transform by Power series expansion and partial fraction expansion, one sided z-transform, Transient and steady state response, Causality and stability

Unit IV: Discrete Fourier Transform (DFT) **(6 Hrs)**

Frequency Domain Sampling, DFT as Linear Transformation, Properties of DFT: Periodicity, Linearity, Symmetry, Circular Convolution, Time reversal, circular time shift and frequency shift, Parseval theorem

Unit V: IIR and FIR Filter Design **(6 Hrs)**

Impulse invariant transformation, Bilinear transformation, IIR Butterworth and Chebyshev filter design, FIR filter design using windowing techniques

Unit VI: Digital Filter Structures **(6 Hrs)**

Structure for the realization of Discrete time system, Structures for FIR System: Direct Form structures, Cascade Form structures, Linear Phase structures, Lattice structures, Structures for IIR System: Direct Form, Cascade, Parallel and transpose Form structures, Signal flow graph.

Text books:				
1	"Digital Signal Processing - Principles, algorithms and applications"	4th edition, 2013	John G. Proakis	McGraw-Hill

2	"Discrete time Signal Processing"	3rd edition 2010	Alan Oppenheim, Ronald Schafer and Buch	Pearson
3	"Digital Signal Processing - A computer based approach," Publication	4th edition, 2013	Sanjit K. Mitra,	McGraw-Hill
Reference books:				
1	Digital Signal Processing	3rd Edition 2017	S Salivahanan A Vallavraj C Gnanapriya	McGraw-Hill

VI Semester
ETM113: Simulation Lab

Course Learning Objective Students will be able to	Course Outcomes Students will be able to
1) Learn Signals and System. 2) Understand discrete time signal and system 3) Understand interfacing of different peripherals with ATMEGA328 P PU	1) Differentiate Signals and System and perform sampling of signal. 2) Analyse discrete time signal and system. 3) Develop programs in interfacing of different peripherals with ATMEGA328 P PU.

Expt. No.	Name of Experiment
1	Sampling of Continuous time signal
2	Illustration of Aliasing
3	Generation of Discrete time signals
4	Operation on Discrete time signals
5	To find circular convolution of two discrete time signals
6	Toggle LED connected to port pin of ATMEGA 328 P PU and Node MCU.
7	Display message on LCD using ATMEGA 328 P PU and Node MCU.
8	Interfacing Ultrasonic Sensor with ATMEGA 328 P PU and Node MCU.
9	Interfacing Temperature Sensor with ATMEGA 328 P PU and Node MCU
10	Interfacing Smoke and Gas Sensor with ATMEGA 328 P PU and Node MCU

VII Semester
ETM121: Analog and Digital Communication

Course Learning Objective Students should be able to	Course Outcomes Students will be able to
1) Understand the fundamentals of amplitude & angle modulation schemes. 2) Study different types of noise &discrete modulation schemes 3) Study different analog Pulse Modulation and digital modulation schemes 4) Learn various Digital carrier systems 5) Study different Multiple access Techniques and spread spectrum communication techniques	1) Analyze different analog modulation techniques. 2) Analyze different types of noise. 3) Analyze various Digital carrier systems 4) Describe and compare various Multiple access techniques 5) Analyze and apply spread spectrum communication techniques for wireless applications

UNIT-I: **Noise**
External noise, internal noise, Noise calculations, Noise figure, Noise température **(4 Hrs)**

UNIT-II:: Amplitude Modulation
Baseband signals; Modulation (Tone & message); Generation of AM and Demodulation, Double-sideband AM; Double-sideband suppressed carrier AM; AM bandwidth and AM modulation/demodulation, Single-sideband AM; Quadrature carrier multiplexing, Frequency division multiplexing (FDM);Super heterodyne receivers **(7 Hrs)**

Unit 3: Angle (phase & frequency) modulation: introduction; Waveform and bandwidth requirements compared to AM; Spectra of angle modulation, Narrowband angle-modulation case; Wideband angle- modulation, Generation of FM (and PM) signals; Armstrong's direct method of generation; Direct method of generation, Demodulation of angle-modulated signals: Time delay modulator, Slope detector and Balanced discriminator; Feedback demodulators, Interference in angle modulation; Pre-emphasis and de-emphasis; FM broadcasting; Super heterodyne FM receivers **(7 Hrs)**

Unit 4: Analog pulse modulation; Sampling theorem and introduction to sampling, quantization and encoding, Pulse code modulation; Differential pulse code modulation; Delta modulation; Power spectral density; Eye diagrams and bit error rates, Introduction to Digital source coding **(6 Hrs)**

Unit 5: Digital carrier systems – ASK, PSK, binary PSK, FSK, QPSK, digital I/Q modulation, M-ary signaling and bandwidth efficiency, Introduction to channel coding **(6 Hrs)**

Unit 6: Multiple access techniques – Multiplexing (Frequency division multiplexing and Time division multiplexing); frequency domain multiple access,time division multiple access, code division multiple access and spatial division multiple access .
Introduction to spread spectrum communication (DSSS and FHSS); Examples of spread spectrum with Wi-Fi and Bluetooth, Orthogonal frequency division multiple access (OFDMA) applied to wireless communications **(6 Hrs)**

Text books:				
1	Introduction to Analog and Digital communications	2nd Edition	Simon Hykin and Michael Moher	Wlley Publishing, 2006
2	Analog and Digital Communications Theory and Lab Work	1st edition	Abhay Gandhi	Cengage Learning Publishing, 2015.
3	Modern Analog and Digital Communication Systems.	3rd Edition	B. P.Lathi	Oxford University Press, 2007

Reference books:				
1	Electronic Communication Systems	-	Blake	Thomson Delmar Publications, 2002
2	Analog and Digital Communication System	3rd Edition	Martin S. Roden	Prentice Hall of India, 2002.
3	Wireless Communications: Principles and Practice	2nd Edition	Rappaport T.S	Pearson Education, 2007
4	Principles of Communication	3rd Edition	H.Taub, D L Schilling and G Saha	Pearson Education, 2007
5	Digital Communication Fundamentals and Applications	2nd Edition	B.Sklar	Pearson Education 2007.
6	Advanced Electronic Communication Systems	6th Edition	Wayne Tomasi	Pearson Education, 2009

VII Semester

ETM122: Lab: Analog and Digital Communication

Course Learning Objective Students will be able to	Course Outcomes Students will be able to
1) Understand the fundamentals of amplitude & angle modulation schemes. 2) Study different types of noise &discrete modulation schemes 3) Study different Analog Pulse Modulation and digital modulation schemes 4) Learn various Digital carrier systems 5) Study different Multiple access Techniques and spread spectrum communication techniques	1) Analyze different analog modulation techniques. 2) Analyze different types of noise. 3) Analyze various Digital carrier systems 4) Describe and compare various Multiple access techniques 5) Analyze and apply spread spectrum communication techniques for wireless applications

Expt. No.	Name of Experiment
1	Study of Amplitude Modulation and De-modulation
2	Study of Frequency Modulation and De-modulation
3	Generation of SSB-SC using balanced modulator
4	Generation of DSB-SC
5	Generation of Pulse Width modulation
6	Study of Sampling & reconstruction
7	Generation of Pulse code modulation
8	Generation of frequency shift keying
9	Study of Time Division Multiplexing
10	Generation of Delta Modulation

YESHWANTRAO CHAVAN COLLEGE OF ENGINEERING
(An Autonomous Institution affiliated to R T M Nagpur University Nagpur)
Accredited by NAAC (1st Cycle) with 'A' Grade (Score 3.25 on 4 Point Scale)
Wanadongri, Hingna Road, Nagpur-441110

Department of Electronics & Communications Engineering (Minor in MIAI)

B.E. Minor in Medical Imaging and Informatics SoE & Syllabus 2022-23

B.E Minor in Medical Imaging and Informatics

Information Brochure of Minor Program

1. Title of Program: **Medical Imaging and Informatics**
2. Type of Program : **Minor**
3. Department offering the program: **Electronics and Telecommunication Engineering**
4. Collaboration: **DATTA MEGHE MEDICAL COLLEGE**

   Hingna Road, Wanadongri,

   Nagpur, Maharashtra 440016

5. Department/s eligible to opt for the program:
6. The students from **EL, EE, ETC, CT, IT, CSE** are eligible to opt for this program. *Department of Civil Engineering students and Department of Mechanical Engineering students are not permitted to opt for the program.*
7. General information about courses in program:
   - The fusion of medical sciences and engineering would develop the skill based professional which is the need of current situation around the world. In line with the current social need, this course aims to provide an interdisciplinary teaching and research platform to the students.
   - The minor course in medical Imaging and informatics would give an insight of recent technology use for the clinical medical imaging application design, development, and assessment. Students can use the gained skills to develop newer technological innovations in biomedical field and regularize them for high-throughput clinical translation and usage.
   - The courses in the program include study of Human anatomy, medical physiology, medical imaging techniques along with biomedical image and physiological signal analysis, Python for medical data science, and machine learning for healthcare applications which provides the in-depth development of an engineering students in the interdisciplinary field of biomedical engineering.
   - Medical imaging techniques along with biomedical image and signal analysis helps students in biomedical application development.
   - Healthcare sector is getting transformed by the ability to record massive amounts of information about individual patients, the enormous volume of data being collected is impossible for human to analyze. Machine learning provides a way to automatically find patterns and reason about data.

- Students who are looking forward to pursue higher studies in biomedical Engineering in India or abroad or seek jobs in the field of software design for medical data analysis, medical imaging, medical visualization can enroll for this course.

8. Advance knowledge or research orientation of Program: (100 words)

- This course includes specialized courses with fusion of engineering and health care applications which are not covered in general engineering UG programs.
- Due to establishment of companies R&D centers in India like Philips, GE, Siemens R&D centers, great opportunity to the students to work as R&D engineer for medical image analysis and informatics.
- Students can have career in Healthcare sector, Research Centers, Biomedical Software development firms and Biomedical Engineering Firms

9. Employability potential of program:

Due to the great demand and scope of interdisciplinary skill based advance biomedical analysis tools with less human intervention, this minor course would be beneficial for carrying out live projects to solve issues faced by medical professionals, the employability/ entrepreneurship capability of students will be substantially increased due to this program.

- The knowledge of physiological signal and biomedical image analysis, data science, analysis of clinical data using machine learning will be very much beneficial for the students as most of the medical issues could be solved.
- Students who wish to pursue higher studies in the biomedical engineering filled will be immensely benefitted by this Minor programme.

10. Departmental Steering committee: For proper publicity / conduct of program

SN	Name of the Faculty Member	Post	Designation	e-mail ID	Contact Number
1	Dr. M. S. Narlawar	Asst. Prof.	HoD	hod_et@ycce.edu	9763822298
2	Dr. M. M. Mushrif	Prof.	Chairman	milindmushrif@gmail.com	9158888736
3	Dr. Y. U. Chitriv	Asst. Prof.	Member Secretary	yogeetakdubey@gmail.com	9922298656
4	Dr. A. D. Belsare	Asst. Prof.	Member	adbelsare@ycce.edu	8956312259
5	Dr. N. D. Rehpade	Asst. Prof.	Member	nitangp@gmail.com	8983084871

11. Program Coordinator:

SN	**Name of the Faculty Member**	**Post**	**Designation**	**e-mail ID**	**Contact Number**
1	Dr. M. M. Mushrif	Prof.	Chairman	milindmushrif@gmail.com	9158888736

Scheme of Examinations

B.E. Minor in Medical Imaging and Informatics

SN	Sem	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
					L	T	P	Hrs		MSEs*	TA**	ESE	
B.E. Minor in Medical Imaging and Informatics													
1	5	ETM131	Human Anatomy and Medical Physiology	T	3	0	0	3	3	30	30	40	2
2	5	ETM132	Physiological Signal Processing	T	3	0	0	3	3	30	30	40	2
3	5	ETM133	Python for Data Science	P	0	0	2	2	2		60	40	
4	6	ETM141	Biomedical Image Analysis	T	3	0	0	3	3	30	30	40	2
5	6	ETM142	Machine Learning for Health Care	T	3	0	0	3	3	30	30	40	2
6	6	ETM143	Image Analysis and Machine Learning Lab	P	0	0	2	2	1				
7	7	ETM151	Medical Imaging	T	3	0	0	3	3	30	30	40	2
8	7	ETM152	Mini Project	P	0	0	2	2	2		100		
			TOTAL		**15**	**0**	**6**	**21**	**20**				

MSEs* = Three MSEs of 15 Marks each will conducted and marks of better 2 of these 3 MSEs will be considered for Continuous Assessment

TA ** = for Theory : 20 marks on lecture quizzes, 8 marks on assignments, 2 marks on class performance
TA** = for Practical : MSPA will be 15 marks each

V Semester

ETM131	**Human Anatomy & Medical Physiology**			L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
*Best Two out of three MSE's would be considered	15	15	15	30	40	100	3 Hrs
Prerequisites							

Course Objective	**Course Outcome**
Students should be able to 1. Study the structure of human body, cells, heart , lungs and nervous system 2. Study the respiratory, Musculoskeletal System 3. Study of Body Defenses, Gastro Intestinal System (GIT) 4. Study the functioning of various systems with their application in medical imaging	Students will be able to 1. Comprehend the human anatomy in terms of their structure and functions 2. Understand cells, heart , lungs, nervous system 3. Comprehend the respiratory, Musculoskeletal System 4. Understand Body Defenses, Gastro Intestinal System (GIT)

UNIT I :Introduction to Cellular System:

Human body orientation, Structure and organelles, Cell membrane, transport across membrane**06Hrs**

UNIT II :

Hematological System:
Blood composition, Blood flow factorsregulating blood flow such as viscosity, radius, density, etc (Fahraeuslindqvist effect,Poiseuille's Law).

Renal and Respiratory System:
Structure of Kidney and nephron. Mechanism of Urine formation and acid base regulation,Dialysis. Components of respiratory system **06Hrs**

UNIT III :Cardiac System:

Structure of heart, Properties of Cardiac muscle, Cardiac muscle and pacemaker potential, cardiac cycle, ECG, Heart sound, volume and pressure changes **06Hrs**

UNIT IV :**Sensory System:**
Structure of a Neuron, Synaptic conduction, Conduction of action potential in neuron, Parts of brain cortical localization of functions EEG. Structure of eye, ear and auditory and visual pathways. The Lymphatic System & Body Defenses, developmental aspects**06Hrs**

UNIT V: Gastro Intestinal System (GIT)Structure of all organs of GIT (oesophagus Stomach, liver, Pancreas, intestine and colon) with their functions **06 Hrs**
UNIT VI: Musculoskeletal System, All bones and Joints **06Hrs**

Text Books:				
1	Essential of Human Anatomy and Physiology	12th Edition May 2017	Elaine N. Marie,	Pearson Education, New Delhi, 2007
2				
Reference Book:				
1	Review of Medical Physiology	Twenty-Sixth Edition, March 2019	W. F. Ganong	McGraw Hill, New Delhi,
2	Text Book of Physiology	8 Edition, 2019	Prof. A. K. Jain	Avichal Publishing Company, New Delhi, 2005

V Semester

ETM132	Physiological Signal Processing			L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
*Best Two out of three MSE's would be considered	15	15	15	30	40	100	3 Hrs
Prerequisites	Signals and Systems						

Course Objective

1. To Understand the fundamentals of biomedical signal acquisition and signal classification
2. To study the time and frequency domain analysis techniques of physiological signals.
3. To apply adaptive filtering techniques for cancelling noise and interference in the various bio-signals

Course Outcome

Students will be able to

1. Examine the basic signal processing for physiological signals
2. Analyze the bio-signals in time and frequency domain.
3. Apply an adaptive filtering algorithm for bio-signals
4. Comprehend the classification of bio signals using wavelets.
5. Demonstrate the feature reduction and classification methods for different bio-signals

UNIT I :

Physiological Signal Characteristics: Characteristics of dynamic biomedical signals – Noises-random – Structured and Physiological noises – Filters – IIR and FIR filters.

Spectrum Analysis: Spectrum – Power Spectral Density function –Cross Spectral Density and Coherence function – Cepstrum and Homomorphic filtering – Estimation of mean of finite time signals.

06Hrs

UNIT II :

Time Series Analysis: Time series analysis – Linear prediction models – Process order estimation – Lattice representation –Non-stationary process –Fixed segmentation – Adaptive segmentation – Application in EEG, PCG signals – Time varying analysis of Heart-rate variability –Model based ECG simulator.

06Hrs

UNIT III :

Frequency Domain Analysis: Spectral estimation – Blackman Tukey method – Periodogram – Model based estimation – Application in heart rate variability, PCG signals.

06Hrs

UNIT IV :

Adaptive Filtering: Filtering – LMS adaptive filter –Adaptive noise canceling in ECG – Improved adaptive filtering in FECG.

05Hrs

UNIT V:

Wavelet Detection and Bio-signal Classification: Wavelet detection in ECG – Structural features – Matched filtering – Adaptive wavelet detection –Detection of overlapping wavelets – Signal classification and recognition – Statistical signal classification –Linear discriminant function –Direct feature selection and ordering.

06Hrs

UNIT VI:

Time Frequency and Multivariate Analysis:
Back propagation neural network based classification – Application in Normal versus Ectopic ECG beats – Time frequency representation – Spectrogram – Wigner distribution – Time-Scale representation – Scalogram –Wavelet analysis – Data reduction techniques – ECG data compression – ECG characterization – Feature extraction – Wavelet packets – Multivariate component analysis –PCA – ICA.

07Hrs

Text Books:

1	Biomedical Signal Processing	2nd edition	Rangaraj. M. Rangayyan	Wiley-IEEE Press 2015
Reference Book				
1	Biomedical Signal Processing: Principles and techniques		D. C. Reddy	Tata McGraw Hill, New Delhi, 2012
2	Bio-signal and Medical Image Processing	3rd edition	John L. Semmlow, Benjamin Griffel	CRC Press
3	Biomedical Signal Processing	1st edition	N.Vyas	University Science Press, New Delhi.

V Semester

ETM133	Python for Data Science			L= 0	T = 0	P = 2	Credits = 2
Evaluation Scheme	MSE-I	MSE-II	MSE III	CA	ESE	Total	ESE Duration
				60	40	100	3 Hrs
Prerequisites	Basic Programming						

Course Objective	Course Outcome
Students should be able to 1. Learn basics of python and data structure 2. Learn Python Programming Fundamentals 3. Learn pandas for data analysis in Python 4. Learn data visualization tools in python	Students will be able to 1. Apply the concepts of python basic and data structure for problem analysis 2. Apply python flow control and functions for programming 3. Use pandas package for data analysis in Python. 4. Create plots and visuals using matplotlib package

Unit I : Python Basics
Types**,** Expressions and Variables**,** String Operations

Unit II Python Data Structures
Lists and Tuples**,** Sets**,** Dictionaries

Unit III: Python Programming Fundamentals
Conditions and Branching, Loops, Functions, Objects and Classes

Unit IV: Working with Data in Python
Reading files with open, Writing files with open, Loading data with Pandas, Working with and Saving data with Pandas, Importing and Exporting Data in Python, Identify and Handle Missing Values, Data Formatting

Unit V: Introduction to Visualization Tools
Introduction to Matplotlib, Basic Plotting with Matplotlib, Line Plots, Area Plots, Histograms, Bar Charts

Unit VI: Specialized and advanced Visualization Tools
Pie Charts, Box Plots, Scatter Plots, Bubble Plots, Waffle Charts, Word Clouds, Seaborn and Regression Plots

Reference Courses:				
1	https://cognitiveclass.ai/courses/python-for-data-science		Joseph	Cognitive Class
2	https://courses.cognitiveclass.ai/courses/course-v1:CognitiveClass+DV0101EN+v1/course/			Cognitive Class

VI Semester

ETM141	Biomedical Image Analysis			L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
*Best Two out of three MSE's would be considered	15	15	15	30	40	100	3 Hrs
Prerequisites							

Course Objective

Students should be able to

1. Discuss biomedical image fundamentals.
2. Learn artifacts removal image enhancement techniques.
3. Identify the segmentation techniques for feature extraction.
4. Study the shape and texture based methods.

Course Outcome

Students will be able to

1. Comprehend image acquisition and sampling.
2. Process the given images to enhance them in spatial and frequency domains.
3. Extract features from a given image by segmentation.
4. Analyze the shape and texture-based features.

UNIT I :

Introduction: Nature of biomedical images, objectives of biomedical image analysis, difficulties in image acquisition and analysis, characterization of image quality, digitization of images, dynamic range, contrast, histogram, blur and spread functions, resolution, signal-to-noise ratio.

06Hrs

UNIT II :

Removal of Artifacts: Characterization of artifacts and its removal, synchronized or multiframe averaging, spatial and frequency domain filters.

06Hrs

UNIT III :

Image Enhancement: Temporal subtraction, gray-scale transforms, histogram transformation, convolution mask operators, high frequency emphasis, homomorphic filtering for enhancement, adaptive contrast enhancement.

06Hrs

UNIT IV :

Image segmentation: Fundamentals, detection of isolated points and lines, edge detection, segmentation and region growing, optimal thresholding, region splitting and merging, morphological watersheds, detection of objects of known geometry. Applications based on image segmentation.

06Hrs

UNIT V:

Analysis of Shape: Representation of Shapes and Contours, Shape Factors Fourier Descriptors, Fractional Concavity, Analysis of Spicularity.

06Hrs

UNIT VI:

Analysis of Texture: Texture in Biomedical Images, Models for the Generation of Texture, Statistical Analysis of Texture, Laws Measures of Texture Energy, Fractal Analysis, Fourier domain Analysis of Texture.

06Hrs

Text Books:				
1	Biomedical Image Analysis	1st edition	Rangaraj. M. Rangayyan	CRC Press, 2005 http://bio.marstu.net/data/materials/books/biomedical.pdf
2	Medical image analysis	2nd Edition	Atam P Dhwan	Wiley-IEEE Press
Reference Book:				
1	Digital Image Processing	4th edition	R C Gonzalez & R E Woods	Pearson Education, 2018
2	Fundamentals of Digital Image processing	1st edition	A K Jain	PHI / Pearson Education 2011
3	Digital Image Processing and Analysis		Chanda and Majumder	PHI Learning Pvt. Ltd., 2004
4	Biomedical Imaging, Visualization, and Analysis		Taylor & Francis, Richard A. Robb	John Wiley & Sons, 1999.

VI Semester

ETM142	**Machine Learning for Health Care**			L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme *Best Two out of three MSE's would be considered	MSE-I	MSE-II	MSE III*	TA	ESE	Total	ESE Duration
	15	15	15	30	40	100	3 Hrs
Prerequisites	Basic probability, statistics and linear algebra						

Course Objective

Students should be able to

1) Understand the concepts of machine learning and regression models
2) Understand the concept of classification for model evaluation.
3) Learn Supervised and unsupervised learning algorithms.
4) Learn the concept of artificial neural network and deep networks

Course Outcome

Students will be able to

1) Apply and analyze the model using regression.
2) Apply and evaluate the performance of system for classification.
3) Apply Supervised and unsupervised learning for problem solving.
4) Apply neural network algorithms for classification.
5) Describe and evaluate deep neural network with computational complexity.

UNIT-1 Regression

Supervised and Unsupervised Learning, Regression, Model and Cost Function, Gradient Descent, Multivariate Linear Regression, Feature Scaling, Gradient Descent for multivariable, heart disease prediction

(06 Hours)

UNIT-2: Classification

Classification, Hypothesis Representation, Decision Boundary, Cost function and Gradient Descent, Multi-classification, Regularization, Model Evaluation, DNA Classification

(06 Hours)

UNIT-3: Supervised Learning

KNN, SVM, Decision tree, Naive Bayes Classifiers, Random Forest, breast cancer detection

(06 Hours)

UNIT 4: Unsupervised learning

K-means clustering, Hierarchical Clustering, DBSCAN Clustering, PCA, Anomaly Detection, Recommender System, Application on health data

(06 Hours)

Unit 5: Artificial Neural Network

Introduction to neural network, Activation Functions, Perceptron rule, Backpropagation, heart diseases prediction

(06 Hours)

Unit 6: Deep Learning

Introduction to deep learning, building blocks of CNN, Computational Complexity, CNN Architectures, medical image analysis

(06 Hours)

Text Books:			
1	Understanding Machine Learning. https://www.cse.huji.ac.il/~shais/ Understanding Machine Learning/ copy.html	Shai Shalev-Shwartz and Shai Ben-David.	Cambridge University Press. 2017
2	The Elements of Statistical Learning. https://web.stanford.edu/~hastie/ Elem Stat Learn/	Trevor Hastie, Robert Tibshirani and Jerome Friedman.	Second Edition 2009
3	Pattern Recognition and Machine Learning. https://www.microsoft.com/enus/research/people/cmbishop/downloads/	Christopher Bishop	Springer 2006
Reference Book:			
1	Foundations of Data Science.	Avrim Blum, John Hopcroft and Ravindran Kannan.	Januar y 2017
2	Deep Learning, Part II, http://www.deeplearningbook.or g/	Goodfellow, I., Bengio, Y., Courville, A.	MIT Press 2016
3	Machine Learning: A Probabilistic Perspective	Kevin P. Murphy	MIT Press 2012
4	MACHINE LEARNING An Algorithmic Perspective	Stephen Marsland	Second Edition, Chapman & Hall/CRC

VI Semester

ETM143	**Image Analysis and Machine Learning Lab**			L= 0	T = 0	P = 2	Credits = 1
Evaluation Scheme	MSE-I	MSE-II	MSE III	CA	ESE	Total	ESE Duration
				60	40	100	3 Hrs
Prerequisites	Pyhon Programming						

Experiments Based on
Biomedical Image Enhancement
Biomedical Image Segmentation
Feature Extraction based on Shape analysis
Feature Extraction using Texture Features
Heart Disease Predication
Breast Cancer Detection
DNA Classification
Biomedical Image Classification

VII Semester

ETM151	**Biomedical Imaging**			L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
*Best Two out of three MSE's would be considered	15	15	15	30	40	100	3 Hrs
Prerequisites	Digital Image Processing for Medical Applications						

Course Objective

Students should be able to

1. Study the production of x-rays and its application in medical imaging
2. Study the different types of Radio diagnostic techniques
3. Study the special imaging techniques used for visualizing the cross sections of the body.

Course Outcome

Students will be able to

1. Comprehend the acquisition techniques involved in different X Ray medical imaging
2. Conceive the historical evolution of the imaging methods pertaining to computed tomography and to excel with different reconstruction techniques and programming techniques for noise removal.
3. Comprehend the principle of operation of modules employed in magnetic resonance imaging
4. Comprehend the Ultrasound imaging system and the principle of operation of modules employed in thermal imaging

UNIT I :

X – Rays: Nature of X-Rays - X-ray Absorption - Tissue Contrast. X-Ray Equipment – X-ray Tube, collimator, Bucky Grid, power supply. Digital Radiography - discrete digital detectors, storage phosphor and film Scanning. X-Ray Image intensifier tubes - Fluoroscopy – Digital Fluoroscopy. Angiography, Cine angiography. Digital Subtraction Angiography. Mammography

06Hrs

UNIT II :

Computed Tomography: Principles of Tomography - First to Fifth generation scanners – Image reconstruction Technique - Back projection and Iterative method. Spiral CT Scanning - Ultra fast CT Scanners- X-Ray Sources – Collimation – X-Ray Detectors – Viewing System

06Hrs

UNIT III :

Magnetic Resonance Imaging: Fundamentals of Magnetic Resonance- Interaction of nuclei with static Magnetic Field and Radio frequency wave – Rotation and Precession –induction of a magnetic resonance signal – bulk Magnetization – Relaxation Processes T1 and T2, **MRI System and its components:** MRI system- System Magnet, generation of Gradient magnetic Fields, Radio Frequency coils, Shim coils, Electronic components

06Hrs

UNIT IV:

Emission Imaging: Alpha, Beta, Gamma Emission, different types of Radiation Detectors, G.M. & Proportional Counters, Pulse Height Analysers, Isotopic, Scanners, Principle of PET and SPECT, PET/CT

06Hrs

UNIT V:

Ultrasound Imaging & Thermography: Wave propagation and interaction in Biological tissues, Acoustic radiation fields, continuous and pulsed excitation, Transducers and imaging systems, Scanning methods, Imaging Modes-A, B & M, Principles and theory of image generation, Thermography-Principle, detectors and applications.

06Hrs

UNIT VI:

Medical Image Computing & Visualization for Diagnosis and Therapy: Automated Image Computing, Computational Strategies for Automated Medical Image Computing, Data Classification/Regression, model fitting, 2D Visualization, 3D Rendering, VR, AR

06Hrs

Text Books:				
1	Fundamentals of Medical Imaging	2017, 3rd edition	Paul Suetens	Cambridge University Press, Cambridge, New York.
2				
Reference Book:				
1	Intermediate Physics for Medicine and Biology	2015, 1st edition,	Russell K. Hobbie, Bradley J. Roth	Springer International Publishing, Switzerland
2	Physics and Radiobiology of Nuclear Medicine	2013, 4th edition,	Gopal B. Saha	Springer, Verlag, New York

VII Semester

ETM152	**Mini Project**	L= 0	T = 0	P = 2	Credits = 2

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(An Autonomous Institution affiliated to R T M Nagpur University Nagpur)
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Wanadongri, Hingna Road, Nagpur-441110

Department of Computer Technology
(Minor in CT)

B.E. Minor in Computer Technology
SoE & Syllabus 2022-23

B.E Minors in Computer Science & Engineering

Information Brochure of Minor Program

1. Title of Program: **Minors course in Computer Technology**
2. Type of Program : **Minor**
3. Department offering the program: **Computer Technology**
4. Industry / Association / Collaboration: No
5. Department/s eligible to opt for the program:

The students from CE, EL, ME, EE, ETC are eligible to opt for this program.

Department of Computer Technology and Department of Information Technology students are not permitted to opt for the program.

6. **General information about courses in program:**

Computer scientists and engineers can have a huge impact on the future of the field.

The field of Computer Technology inherently give support to the other engineering domain. While studying any engineering discipline, student may develop interest in the computer technology because of its ability to provide the solution for the other domains.

This minor course in Computer Technology is designed to provide the fundamental knowledge of the computer technology.

The courses in this program are the core courses from the field like Operating System, Computer Networks, Data Structures and Database Management System. This program includes the courses on the advance technologies used in the IT industry, like Web Technology and Python Programming. All the core courses from the program are also having the practical component.

7. **Employability potential of program:**

Many of the students from other engineering disciplines are ultimately landed in the IT company. In such scenario, students will be highly benefited by this course. This course helps them to create their unique identity in the selection process for the job.

The courses like Data Structure and Database Management System are playing very important role in the selection process of the industry. The students of this program are automatically benefited in this area. Also Python programming is the widely used programming language in the industry, its knowledge will definitely helps the non-IT students in cracking the interview or technical tests.

Overall this program is going to increase the employability among the non-IT students in the IT industry.

8. Departmental Steering committee: For proper publicity / conduct of program

SN	Name of the Faculty Member	Post	Designation	e-mail ID	Contact Number
1	Dr. G. M. Dhopavkar	HoD & Chairman	Asst. Prof.	hod_ct@ycce.edu	9822087970
2	Dr. P. A. Deshkar	Member	Asst. Prof.	padeshkar@ycce.edu	9923401052
3	Dr. K. R. Singh	Member	Asso. Prof.	singhkavita19@gmail.com	8275783031
4	Dr. S. D. Kamble	Member	Asso. Prof.	shailesh_2kin@rediffmail.com	9158886477
5	Dr. R. D. Wajgi	Member	Asst. Prof	rdwajgi@ycce.edu	9970238062
6	Prof. N. M. Mangrulkar	Member	Asst. Prof.	nmangrulkar@ycce.edu	7767888776

9. Departmental coordinator

SN	Name of the Faculty Member	Post	Designation	e-mail ID	Contact Number
1	Dr. Prarthana A. Deshkar	Member	Asst. Prof.	padeshkar@ycce.edu	9834359349

Scheme of Examinations

Minors in Computer Technology

SN	Sem	Sub. Code	Subject	T/	Contact Hours				Credits	% Weightage			ESE Duration Hours
					L	T	P	Hr		MS	TA	ESE	
1	5	CTM101	Fundamentals of Algorithm	T	3	0	0	3	3	30	30		40
2	5	CTM102	Lab: Fundamentals of Algorithm	P	0	0	2	2	1			60	40
3	5	CTM103	Data Structures	T	3	0	0	3	3	30	30		40
4	5	CTM104	Lab:Data Structures	P	0	0	2	2	1			60	40
5	6	CTM111	Operating Systems	T	3	0	0	3	3	30	30		40
6	6	CTM112	Lab:Operating Systems	P	0	0	2	2	1			60	40
7	6	CTM113	Database Management Systems	T	3	0	0	3	3	30	30		40
8	6	CTM114	Lab: Database Management Systems	P	0	0	2	2	1			60	40
9	7	CTM121	Lab: Python Programming	P	0	0	2	2	1			60	40
10	7	CTM122	Lab: Web Technology	P	0	0	2	2	1			60	40
					12	**0**	**12**	**24**	**18**				

MSEs* = Three MSEs of 15 Marks each will conducted and marks of better 2 of these 3 MSEs will be considered for Continuous Assessment

TA ** = for Theory : 20 marks on lecture quizzes, 8 marks on assignments, 2 marks on class performance
TA = for Practical : MSPA will be 15 marks each**

V Semester

CTM101	Fundamentals of Algorithms			L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme *Best Two out of three MSE's would be considered	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
	15	15	15	30	40	100	3 Hrs
Prerequisites							

Course Objective

Students should be able to:

1. Understand different asymptotic notations.
2. Have an appreciation of different mathematical principles of algorithm analysis
3. Gain an understanding and apply various algorithm design strategies like divide and conquer strategy, greedy strategy, dynamic programming strategy and backtracking strategy.
4. To understand various complexity classes like P, NP, NP-complete and NP-Hard.

Course Outcome

Students will be able to

1. Compare different types of asymptotic notations and find the time complexity in terms of asymptotic notations.
2: Solve recurrences using various techniques.
3. Implement divide and conquer strategy, greedy strategy, dynamic programming algorithms and backtracking strategy
4. Identify and differentiate between various types of complexity classes.

UNIT I :

Mathematical foundations, summation of arithmetic and geometric series, ∑n, ∑n2, bound summations using integration, analyzing control structures, worst case and average case analysis, Asymptotic notations

5 hrs

UNIT II :

Recursive functions and recurrence relations, solutions of recurrence relations sing technique of characteristic equation and generating functions.

5 hrs

UNIT III :

Divide and conquer basic strategy, binary search, quick sort, merge sort

Greedy method – basic strategy, application to job sequencing with deadlines problem, minimum cost spanning trees, etc.

5 hrs

UNIT IV : Dynamic Programming basic strategy, all pair shortest path, single source shortest paths, traveling salesman problem. **5 hrs**
UNIT V: Basic Traversal and Search Techniques, breadth first search, connected components, Backtracking basic strategy, 8 – Queen‟s problem. **5 hrs**
UNIT VI: NP-hard and NP-complete problems, basic concepts, non-deterministic algorithms, NP-hard and NP-complete, **5 hrs**

Text Books:

1. "Computer Algorithms", Horowitz, Sahni, Rajasekaran, Universities press
2. "Introduction to Algorithms", Cormen ,Leiserson, Rivest, Stein, Prentice Hall of India
3. "Fundamentals of Algorithms", Brassard, Bratley, Prentice Hall of India

V Semester

CTM102	Lab: Fundamentals of Algorithms			L= 0	T = 0	P = 1	Credits = 1
Evaluation Scheme	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
*Best Two out of three MSE's would be considered	--	--	--	60	40	100	3 Hrs
Prerequisites							

Course Objective

Students should be able to:

2. Understand different asymptotic notations.
2. Have an appreciation of different mathematical principles of algorithm analysis
3. Gain an understanding and apply various algorithm design strategies like divide and conquer strategy, greedy strategy, dynamic programming strategy and backtracking strategy.
4. To understand various complexity classes like P, NP, NP-complete and NP-Hard.

Course Outcome

Students will be able to

2. Compare different types of asymptotic notations and find the time complexity in terms of asymptotic notations.
2: Solve recurrences using various techniques.
3. Implement divide and conquer strategy, greedy strategy, dynamic programming algorithms and backtracking strategy
4. Identify and differentiate between various types of complexity classes.

V Semester

CTM103	Data Structures			L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
*Best Two out of three MSE's would be considered	15	15	15	30	40	100	3 Hrs
Prerequisites							

Course Objective

Students should be able to

1. To make students familiar with syntaxes and usages of various programming constructs of C language.
2. To make student understand concept of abstract data types like stacks and queues.
3. To make student understand file handling operations.
4. To create thinking ability needed for implementation of programming logic with proper use of memory

Course Outcome

Students will be able to

1. To Identify programming constructs needed to solve real world problems.
2. To Implement various abstract data types
3. To Write program for file handling by using various access modes and operations needed as per the requirement of given problem.
4. To Implement programming logic needed for solving given problem

UNIT I :

Types and operations, Iterative constructs and loop invariants, Quantifiers and loops, Structured programming and modular design, Illustrative examples, Scope rules, parameter passing mechanisms, recursion, program stack and function invocations including recursion

UNIT II :

Overview of arrays and array based algorithms - searching and sorting: merge sort, quick sort, Sparse matrices.

UNIT III :

Structures (Records) and array of structures (records). Database implementation using array of records. Dynamic memory allocation and deallocation. Dynamically allocated single and multi-dimensional arrays, polynomial representation

UNIT IV :

Concept of an Abstract Data Type (ADT), Lists as dynamic structures, operations on lists, implementation of linked list using arrays and its operations. Introduction to linked list implementation using self-referential-structures/pointers

UNIT V: Stack, Queues and its operations. Implementation of stacks and queues using both array-based and pointer-based structures. Applications of stacks and queues.
UNIT VI: Files, operations on them, examples of using file

Text Books:				
	Title	**Edition**	**Author**	**Publisher**
1	Fundamentals of Data Structures in C++	Latest Edition	Ellis Horowitz, Sartaj Sahani, Dinesh Mehta	University Press
2	Data Structures and Program Design in C	Latest Edition	Robert Kruse, Cl Tondo	Pearson Education
Reference Book:				
	Title	**Edition**	**Author**	**Publisher**
1	Data Structures with C	Latest Edition	Seymour Lipschutz	TMH
2	Data structures using C	Latest Edition	Reema Thareja	Oxford

V Semester

CTM104	Lab: Data Structures			L= 0	T = 0	P = 1	Credits = 1
Evaluation Scheme	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
*Best Two out of three MSE's would be considered	--	--	--	60	40	100	3 Hrs
Prerequisites							

Course Objective

Students should be able to

1. To make students familiar with syntaxes and usages of various programming constructs of C language
2. To make student understand concept of abstract data types like stacks and queues
3. To make student understand file handling operations
4. To create thinking ability needed for implementation of programming logic with proper use of memory

Course Outcome

Students will be able to

1. To Identify programming constructs needed to solve real world problems.
2. To Implement various abstract data types.
3. To Write program for file handling by using various access modes and operations needed as per the requirement of given problem.
4. To Implement programming logic needed for solving given problem.

1. Program for counting number of digits in a random number
2. Program for generating list of random numerals and print them in words
3. Program to print Pascal's triangle.

```
          1
        1   1
      1   2   1
    1   3   3   1
  1  4   6   4   1
1  5   10   10  5   1
```

4. Program for finding GCD of two numbers using factorial method
5. Program for finding GCD of two numbers using recursion. Also, print number of recursive calls.
6. Program for allocating memory dynamically for single dimensional array and sort it using quick sort and merge sort
7. Program for allocating memory dynamically for two-dimensional array printing it in spiral manner.
8. Program to create linked list of cell phone with any 3 attributes as data fields and print it
9. Program to create file for storing details of all the items needed for playing any game of your choice also
   perform display, insertion of new record at any location, deletion of any record
10. Program to implement stack and print MAX data item from it

VI Semester

CTM111	Operating Systems			L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
*Best Two out of three MSE's would be considered	15	15	15	30	40	100	3 Hrs
Prerequisites							

Course Objective

Students should be able to

1. To learn different types of OS & services provided by OS.
2. To understand process management and inter-process communication.
3. To know the deadlock concepts & deadlock avoidance algorithms.
4. To understand the need of memory management.
5. To learn different file system organization.

Course Outcome

Students will be able to:

1. Analyze & compare different OS & its services.
2. Apply & analyze CPU scheduling algorithm & also find different ways to synchronize the process.
3. Use different methods to handle deadlock.
4. Apply various memory management techniques.
5. Compare various disk scheduling algorithms based on their performances.

UNIT I :

Introduction, services provided by OS, functions of OS, system calls.
Process management-introduction, process control block, process states, process context switch, threads: user level and kernel level

UNIT II :

CPU scheduling, goals of scheduling, CPU scheduling algorithms: FCFS, SJF, SRTF, RR, Priority based.
Inter-process communication: process cooperation and synchronization, race condition, critical section, mutual exclusion and implementation, semaphores, classical inter-process communication problems.

UNIT III :

Deadlocks: System Model, deadlock characterization-necessary conditions, resource allocation graph (RAG), methods for handling deadlock-deadlock avoidance, deadlock detection, deadlock prevention, recovery from deadlock

UNIT IV :

Memory management techniques-contiguous and non-contiguous, paging and segmentation, translation look aside buffer (TLB) and overheads

UNIT V:
Virtual memory and demand paging, page faults, page replacement algorithms, thrashing and working set model.

UNIT VI:
File systems-introduction, disk space management and space allocation strategies, directory structures, disk caching, disk arm scheduling strategies: FCFS, SSTF, SCAN, CSACN, LOOK, CLOOK, File Organization: Sequential, Index, Index Sequential

Text Books:

	Title	Edition	Author	Publisher
1	Operating system concepts	Latest Edition	A. Silberchatz and P.Galvin	Addison Wesley Longman Inc.
2	Operating system Principles	Latest Edition	A. Silberchatz and P.Galvin	John Wiley & Sons Inc.

Reference Book:

	Title	Edition	Author	Publisher
1	Modern operating systems	Latest Edition	A.S. Tanenbaum	Prentice Hall of India publication.
2	Operating System	Latest Edition	Crowley	Tata McGraw Hill publication

VI Semester

CTM112	Lab:Operating Systems			L= 0	T = 0	P = 1	Credits = 1
Evaluation Scheme	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
*Best Two out of three MSE's would be considered	--	--	--	60	40	100	3 Hrs
Prerequisites							

Course Objective

Students should be able to

1. To learn different types of OS & services provided by OS.
2. To understand process management and inter-process communication.
3. To know the deadlock concepts & deadlock avoidance algorithms.
4. To understand the need of memory management.
5. To learn different file system organization

Course Outcome

Students will be able to

1. Analyze & compare different OS & its services.
2. Apply & analyze CPU scheduling algorithm & also find different ways to synchronize the process.
3. Use different methods to handle deadlock.
4. Apply various memory management techniques.
5. Compare various disk scheduling algorithms based on their performances.

- Basics of Linux commands and its use.
- Write a shell script to find maximum of 3 numbers.
- (ii)Write a shell script to check whether entered number even or odd
- Write a shell script to find factorial of a number
- (ii)Write a shell script to find the sum of all the digits of a number
- Write a program to create a process using fork( ) system call.
- Write a program to implement Non-Preemptive Priority scheduling algorithm.
- Write a program to implement FIFO page replacement algorithm.
- Write a program to implement First-Fit/Worst-Fit strategies
- Installation of Linux Operating System.
- Case study on Advanced Operating System (Ameoba).

VI Semester

CTM113	Database Management Systems			L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
*Best Two out of three MSE's would be considered	15	15	15	30	40	100	3 Hrs
Prerequisites							

Course Objective

Students should be able to

1. To learn different database system concepts
2. To learn the designing of Entity Relationship Diagram.
3. To know relational data model, relational algebra& SQL Queries.
4. To understand relational database design.
5. To know about data integrity issues

Course Outcome

Students will be able to

1. Analyze & compare different levels of abstraction & data independence.
2. Design Entity Relationship Diagram for any scenario.
3. Solve queries based on relational algebra & SQL.
4. Identify functional dependencies & normalise the database and apply ACID properties.
5. Analyse transaction management, various concurrency control protocols and crash recovery methods

UNIT I :

Introduction to Database Management System: General File System and Database system Concepts and Architecture, Data Models, Schemas and Instances, Abstraction & Different Levels of Data Abstraction, Data Independence: Logical & Physical Independence

UNIT II :

Entity-Relationship Model: Entities and Entity Sets, Relationships and Relationship Sets, Attributes, Mapping Constraints, Keys, Entity Relationship Diagram, Reducing E-R Diagrams to Tables, Generalization, Aggregation, Design of an E-R Database Scheme.

UNIT III :

SQL: Data definition language (DDL), Data Manipulation Language (DML), Basic structure of SQL Queries, Set operations, Null Values, Nested subqueries, views, modification of database, transaction, Joins.

Advanced SQL: SQL data types & schemas, Integrity Constraints, Domain Constraints, Assertions, triggers, Advanced SQL Features

UNIT IV :

Relational Data Model: Structure of Relational Databases

Relational Algebra: Structure of relational databases, Fundamental Relational-Algebra Operations, Additional relational algebra operations, extended relational algebra operations, modification of the databases
UNIT V: **Relational Database Design**: Pitfalls in Relational Database Design, Functional Dependencies, Normalization using Functional Dependencies, Alternative Approaches to Database design. **Transaction Management**: ACID Properties, Implementation of ACID Properties, Database processes to support ACID Properties, Schedules, and Testing of Serializability.
UNIT VI: **Concurrency Control**: Lock-based Protocols, Timestamp Based Protocols, Validation Techniques, Multiple Granularity, Multi version Timestamp Protocol, Transaction isolation levels, Read consistency. **Crash Recovery**: Failure Classification, Log Based Recovery, Buffer Management, Checkpoints, Shadow Paging..

Text Books:

	Title	Edition	Author	Publisher
1	Database System Concepts	Latest Edition	Korth, Silberschatz	McGraw-Hill publication
2	Fundamentals of Database Systems	Latest Edition	Elmasri, Navathe & Gupta	Pearson Education

Reference Book:

	Title	Edition	Author	Publisher
1	Database Systems	Latest Edition	Connolly	Pearson Education
2	Principles of Database Systems	Latest Edition	Ullman	Golgotia Publications

VI Semester

CTM114	Lab: Database Management Systems			L= 0	T = 0	P = 1	Credits = 1
Evaluation Scheme *Best Two out of three MSE's would be considered	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
	--	--	--	60	40	100	3 Hrs
Prerequisites							

Course Objective

Students should be able to

1. To Understand fundamental database concepts and the different database systems, methodologies to conceptualize systems.
2. To model an application's data requirements using conceptual modeling tools like ER diagrams and design database schemas based on the conceptual model.
3. To understand, advanced develop applications involving advanced database systems.
4. To Know Various database concepts, Identify the key issues in developing database systems and applications.

Course Outcome

Students will be able to

1. Design relational database for any given problem, write appropriate queries for accessing database.
2. design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs.
3. Examine the different operation of Transaction to design efficient system.
4. Compare among different types of database and its different concept

- Study of My-SQL
- Designing of an ER Diagram.
- Designing of Database Schema based on ER diagram.
- Implementation of different DDL commands.
- Implementation of Constraints: Referential Constraints, Domain Constraints
- Implementation of different DML Commands
- Study and Implement Inner join.
- Study and Implement Outer Join.
- Consider the schema for Movie Database:ACTOR (Act_id, Act_Name, Act_Gender)DIRECTOR (Dir_id, Dir_Name, Dir_Phone)MOVIES (Mov_id, Mov_Title, Mov_Year, Mov_Lang, Dir_id)MOVIE_CAST (Act_id, Mov_id, Role)RATING (Mov_id, Rev_Stars)
  Write SQL queries to

1. List the titles of all movies directed by 'Hitchcock'.
2. Find the movie names where one or more actors acted in two or more movies.
3. List all actors who acted in a movie before 2000 and also in a movie after2015 (use JOIN operation).
4. Find the title of movies and number of stars for each movie that has at least one rating and find the highest number of stars that movie received. Sort the result by movie title.
5. Update rating of all movies directed by 'Steven Spielberg' to 5

VII Semester

CTM121	Lab: Python Programming			L= 0	T = 0	P = 1	Credits = 1
Evaluation Scheme	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
*Best Two out of three MSE's would be considered	--	--	--	60	40	100	3 Hrs
Prerequisites							

Course Objective

Students should be able to

1. To make student aware about various programming frameworks of Python
2. To make student familiar with syntax of various data structures and their operation along with control statements in Python
3. To make students comprehend concepts of file handling, classes and objects
4. To make student aware about various packages inbuilt in Python along with their usages

Course Outcome

Students will be able to

1. To select any framework for python programming as per their understanding
2. To write any python program using various data structures and control statements
3. To write program where file handling and concepts of classes and objects are needed
4. To develop advanced applications using functionalities provided under various packages of python

Unit- I:

Python frameworks: Basic syntax, variables and expressions, basic operators, decision making

Unit- II :

Control flow statements: continue, break, Loops: while, for and Functions

Unit- III:

Data structures: list, dictionary, arrays, tuples, sets, strings

Unit- IV:

File handling, Classes and objects

Unit- V:

Introduction to Various Libraries:
NumPy: Fundamental package for scientific computing, NLTK- Natural language toolkit

Unit- VI:

Python patterns- Implementing Graphs NetworkX- A package for the creation, manipulation, and study of the structure, dynamics, and functions of complex networks.

Expt.No.	Experiments based on
01	Informal introduction to programming IDEs Downloading and installing Python
02	Python: variables, operations, control flow - assignments, condition-als, loops, functions
03	Python: types, expressions, strings, lists, tuples, dictionaries
04	Python memory model: names, mutable and immutable values Operations pertaining to various data structures
05	More on Python functions: optional arguments, default values Passing functions as arguments Higher order functions on lists: map, list comprehension
06	Exception handling, Basic input/output, Handling files
07	Classes and Objects
08	Various packages in Python

Text Books:

	Title	Edition	Author	Publisher
1	Introduction to Programming Using Python	Latest Edition	Y. Daniel Liang	Pearson
2	Python: The Complete Reference	Latest Edition	Martin C Brown	McGraw Hill

Reference Book:

	Title	Edition	Author	Publisher
1	Data Structures and Algorithms Using Python	Latest Edition	Rance D. Necaise	Willey

VII Semester

CTM122	Lab: Web Technology			L= 0	T = 0	P = 1	Credits = 1
Evaluation Scheme	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
*Best Two out of three MSE's would be considered	--	--	--	60	40	100	3 Hrs
Prerequisites							

Course Objective
Students should be able to
1. To introduce with the internet technology
2. To study the basic of web page designing
3. To introduce the validations in the web page
4. To introduce the concepts of data storage using XML
5. To learn the advance technique for designing the interactive web page

Course Outcome
Students will be able to
1. Understand various internet technologies
2. To design the web pages using some basic techniques
3. To design and implement the interactive web pages
4. To use the XML technology to store the data
5. To design and develop the interactive web pages using the advanced technique

Unit- I:
INTRODUCTION: Basic tools of internet access, email, ftp, news, www, introduction to internet programming, Electronic Mail, File Transfer protocol, domain Name, client server application, HTTP, URL, Static and Dynamic Web sites .

Unit- II:
WEB PAGE DESIGNING: Creation of web pages: HTML tags, special characters, images, tables, forms, the hyperlinks, Frames.

Unit -III:
SCRIPTING: JAVA SCRIPT: Introduction to Javascript, Basic Syntax, Control Structures, Writing Functions, The Document Object Model, Events Handling.

Unit -IV:
XML: XML basics, understanding markup languages, structures and syntax, valid vs. well formed XML, DTD (document type Definitions) classes. Scripting XML, XML processor, parent child relationship, XML as a data, data type in XML, XML namespaces,

Unit -V:
ASP.NET Fundamentals: ASP.NET Controls, Data Validation Controls, Working with Images.

Unit -VI:
WEBSITE DESIGN USING ASP.NET: Designing sample application in ASP.net, GET & POST

Requests in forms

1. Introduction to Internet (overview of Internet, email, www, broad band, FTP)
2. Study and implement basic html tags
3. Create Web Form by using FORMS in HTML (use any example)
4. Program to demonstrate the use of JavaScript in while and for loops
5. Program to demonstrate the use of JavaScript conditional statements and functions.
6. Demonstrate validation of form controls using simple functions written in JavaScript.
7. Introduction to XML. Program to demonstrate use of External and Internal DTD.
8. To create a web form to demonstrate use of ASP.net web controls – Radio Button Control, Image Control and Link Button Control
9. Create a web form which will accept two numbers as input and perform an operation depending on value selected from dropdown list control.
10. To demonstrate use of validation controls including required field validator, range validator, compare validator, regular expression validator and summary validator.

Text Books:

	Title	Edition	Author	Publisher
1	Learn to code HTML & CSS: develop & style websites	Latest Edition	Shay Howe	[Berkeley]: New Riders, cop.
2	The definitive guide to Netbeans Platform	Latest Edition	HeikoBöck	Berkeley, CA :Apress

Reference Book:

	Title	Edition	Author	Publisher
1	The book of Inkscape	Latest Edition	Dmitry Kirsanov	San Francisco, Calif.:No Starch; Farnham: O'Reilly [distributor]
2	The sed&awk Pocket Reference	Latest Edition	Arnold Robbins	Arnold Robbins

YESHWANTRAO CHAVAN COLLEGE OF ENGINEERING
(An Autonomous Institution affiliated to R T M Nagpur University Nagpur)
Accredited by NAAC (1st Cycle) with 'A' Grade (Score 3.25 on 4 Point Scale)
Wanadongri, Hingna Road, Nagpur-441110

Department of Information Technology
(Minor in CC&BDA)

B.E. Minor in Cloud Computing & Big Data Analytics SoE & Syllabus 2021-23

B.E. Minor in Cloud Computing & Big Data Analytics
Information Brochure of Minor Program

1. Title of Program: **Minor in Cloud Computing & Big Data Analytics**

2. Type of Program : Minor

3. Department offering the program: Information Technology

4. Industry / Association / Collaboration: Industry

5. Department/s eligible to opt for the program: EE, ET, ME,EL,CV

   The students from **CV**, **EL, EE, ETC, ME** are eligible to opt for this program. *Department of Computer Technology and Department of Information Technology students are not permitted to opt for the program.*

6. General information about courses in program: (250 words)

   The next wave of computing is in the Cloud! Increasingly businesses want to get out of the complexity of managing data centers and instead focus on their core competencies. This means that more and more businesses will adopt cloud computing as a means to handle their IT requirements which gives them the freedom from day-to-day management of IT infrastructure.

   Cloud Computing is one of the fastest growing paradigms in the IT industry today. Most of the IT Industry are using resources from Cloud like Amazon Cloud, Google Cloud, Microsoft Cloud etc.

   This B.E. Minor program with the specialization in Cloud Computing and Big Data Analytics will help students understand Cloud Computing and Big Data Analytics technologies. Cloud Computing is very much a work in progress at this time and so while the course comprehensively covers the basic technologies involved, the history of the cloud and its roots in Service Oriented Architecture and Utility Computing, it has ample scope to take in the fast changing models that are thrown out by cloud computing. Students of this program will also

benefit from the several practical credits that provide hands-on capabilities on the various aspects of cloud.

7. Advance knowledge or research orientation of Program: (100 words)
(for Honor)

The scope of cloud computing is very bright. According to a report, the cloud computing market in India is at $2 billion and is expected to grow with an annual growth rate of 30%. By 2020, the cloud computing market in India is supposed to reach $4 billion and create more than a million jobs in this country.

Roles specific to this domain, such as Cloud Infrastructure Engineer, Cloud Architect, Cloud Enterprise Architect, and Cloud Software Engineer, are in massive demand according to a report.

With such expected growth, you can understand how fantastic the career prospects are for professionals in cloud computing.

Cloud computing jobs are on the rise. According to a recent analysis, the international cloud computing market is expected to rise to $72 billion by 2015, and around 3 lakh job opportunities in India are expected in the same period. The roles in Cloud Computing might range from cloud developers to operators. Every role comprises of the knowledge of the cloud computing basics and certain domain specific skills.

8. Employability potential of program: (100 words)

(for both Honor /Minor)

Here are some of the popular Cloud related job profiles:

- Cloud Software Engineer
- Cloud Project Manager
- Cloud Business Analyst
- Cloud Network Architect/Planner
- Cloud Product Manager
- Cloud Sales Executive
- Cloud Developer/Programmer
- Cloud Consultant
- Cloud Systems Engineer
- Cloud Systems Administrator
- Cloud Network Engineer

List of Best Cloud Computing Companies

Amazon Web Services

Kamatera Cloud
Serverspace
Linode
ScienceSoft
ScalaHosting
Cloudways
OVHcloud
LiquidWeb

9. Departmental Steering committee: For proper publicity / conduct of program

SN	Name of the Faculty Member	Post	Designation	e-mail ID	Contact Number
1.	Dr. R. C. Dharmik	HOD, IT & Chairman	Asstt. Prof.	raj_dharmik@yahoo.com	9158003335
2.	Prof. S.S.Chavhan	Member	Asst.prof	sschavhan@ycce.edu	8888832405
3.	Prof. S.W. Shende	Member	Asso. Prof.	shailendra.shende@gmail.com	9766698600
4.	Prof. A.D. Gaikwad	Member	Asst.prof	amolgaikwad.ag@gmail.com	9970743434

10.Program Coordinator:

SN	Name of the Faculty Member	Post	Designation	e-mail ID	Contact Number
1	Prof. A.D. Gaikwad	Member	Asst.prof	amolgaikwad.ag@gmail.com	9970743434

Scheme of Examinations
Minor in Cloud Computing and Big Data Analytics

SN	Sem	Sub. Code	Course Name	T/P	L	P	Hrs	Credits	MSEs	TA	ESE	ESE-Hr
1	V	ITM101	Introduction to Cloud Computing	**T**	3	0	3	3	30	30	40	3
2	V	ITM102	Cloud Architecture & Computing	**T**	3	0	3	3	30	30	40	3
3	VI	ITM111	Big Data Analytics	**T**	3	0	3	3	30	30	40	3
4	VI	ITM112	Lab. : Big Data Analytics	**P**	0	2	2	1		60	40	
5	VI	ITM113	Cloud Security	**T**	3	0	3	3	30	30	40	3
6	VI	ITM114	Lab : Cloud Security	**P**	0	2	2	1		60	40	
7	VII	ITM121	Cloud Application Development using Salesforce	**T**	3	0	3	3	30	30	40	3
8	VII	ITM122	Lab.: Cloud Application Development using Salesforce	**P**	0	2	2	1		60	40	
Total					**15**	**6**	**21**	**18**				

MSEs* = Three MSEs of 15 Marks each will conducted and marks of better 2 of these 3 MSEs will be considered for Continuous Assessment

TA ** = for Theory : 20 marks on lecture quizzes, 8 marks on assignments, 2 marks on class performance
TA = for Practical : MSPA will be 15 marks each**

V Semester

ITM101	Introduction to Cloud Computing			L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
*Best Two out of three MSE's would be considered	15	15	15	30	40	100	3 Hrs
Prerequisites							

Course Objective
Students should be able to

1. To provide students with the fundamentals and essentials of Cloud Computing.
2. To provide students a sound foundation of the Cloud Computing so that they are able to start using and adopting Cloud Computing services and tools in their real life scenarios.
3. To enable students exploring some important cloud computing driven commercial systems and applications.
4. To expose the students to frontier areas of Cloud Computing and information systems, while providing sufficient foundations to enable further study and research.

Course Outcome
Students will be able to

1. To understand the necessary theoretical background for computing and storage clouds environments.
2. To know the methodologies and technologies for the development of applications that will be deployed and offered through cloud computing environments.
3. To be able to realize cloud infrastructures by using IaaS software, while also developing cloud applications by utilizing PaaS software.

UNIT I :
Introduction to Cloud Computing, definition and characteristics of cloud computing, Different Computing Paradigms: Client-Server Computing, Cluster computing, Grid Computing, Distributed Computing, Utility Computing, Fog and Sky Computing, Cloud computing Service Models and deployment models. Advantages and disadvantages of cloud Computing.

UNIT II :
Functioning of Cloud Computing, Cloud Architecture, Cloud Storage, Cloud Computing Concepts: Virtualization, Types of Virtualization, Creation of Virtual Machines, Hypervisors, Types of hypervisor, Load Balancing, Deployment, scalability and Elasticity, Replication, types of replication, cloud Monitoring, Identity and Access Management, Service Level Agreement and Billing System.

UNIT III :

Cloud computing architecture, cloud computing stack, comparison with traditional computing architecture (client-server), cloud storage, server storage, storage as a service, data storage in cloud computing, resource virtualization, Cloud Computing Technology, Introduction, Network- Basic Public Internet, The Accelerated Internet- Optimized Internet Overlay- Site-to-Site VPN, Software defined Network, Network function virtualization.

UNIT IV :

Introduction to cloud application design, cloud design consideration for cloud applications, Design considerations: Scalability, Reliability, Availability, security, maintenance, up gradation and performance, Reference architecture for cloud application, cloud application design methodology, Service Oriented Architecture (SOA), Cloud Component Model (CCM), Data Storage approaches: Relational and Non-relational approaches, example.

UNIT V:

Service Management in Cloud Computing, Service Level Agreements(SLAs), Billing & Accounting, Comparing Scaling Hardware: Traditional vs. Cloud, Economics of scaling: Benefitting enormously, Managing Data: Looking at Data, Scalability & Cloud Services, Database & Data Stores in Cloud, Large Scale Data Processing.

UNIT VI:

Introduction to Amazon Web Services (AWS), Amazon Elastic Compute Cloud (EC2), Amazon Simple Storage Service (S3), Google Compute Engine, Google app engine, Saleforce, Accessing the Cloud, Web Application Framework- Web Hosting Services- Proprietary Methods, Web Applications- API's in Cloud Computing, Browsers for Cloud Computing- Internet Explorer- Mozilla Firefox- Safari- Chrome.

Text Books:

	Title	Edition	Author	Publisher
1	Enterprise Cloud Computing		Gautam Shroff	Cambridge Press
2	Cloud Computing- A Hands On Approach		Arshdeep Bahga, Vijay Madisetti	University Press(INDIA) Private Ltd.

Reference Book:

	Title	Edition	Author	Publisher
1	Google Apps		University Press(INDIA) Private Ltd.	Pearson Publication
2	Cloud Computing for Dummies		Judith Hurwitz, R. Bloor, M. Kanfman, F. Haper	Wiley India Edition

V Semester

ITM102	Cloud Architecture & Computing			L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
*Best Two out of three MSE's would be considered	15	15	15	30	40	100	3 Hrs
Prerequisites							

Course Objective

Students should be able to

1. Learn and understand the different computing paradigms and its architecture
2. Learn and understand the different deployment and Service model of cloud Computing
3. Learn and understand the architecture of cloud that used for design any type of cloud

Course Outcome

Students will be able to

1. Articulate the differences between deployment models and service models of cloud computing.
2. Apply different deployment and Service models for building any type of cloud
3. Identify the cloud architecture for designing any cloud
4. Apply service Management in cloud computing

UNIT I : Introduction to Cloud Computing :

Cloud Computing (NIST Model),Introduction to Cloud Computing, History of Cloud Computing, Cloud service providers, Properties, Characteristics & Disadvantages, Pros and Cons of Cloud Computing, Benefits of Cloud Computing, Cloud computing vs. Cluster computing vs. Grid computing, Role of Open Standards.

UNIT II : Cloud computing stack :

Comparison with traditional computing architecture (client/server), Services provided at various levels, How Cloud Computing Works, Role of Networks in Cloud computing, protocols used, Role of Web services, Service Models (XaaS):Infrastructure as a Service(IaaS),Platform as a Service(PaaS),Software as a Service(SaaS) Deployment Models: Public cloud, Private cloud, Hybrid cloud, Community cloud

UNIT III : Infrastructure as a Service(IaaS):

Introduction to IaaS,IaaS definition, Introduction to virtualization, Different approaches to virtualization, Hypervisors, Machine Image, Virtual Machine(VM),Resource Virtualization, Server Storage ,Network, Virtual Machine(resource) provisioning and manageability, storage as a service, Data storage in cloud computing(storage as a service),Examples, Amazon EC2,Renting, EC2 Compute Unit, Platform and Storage, pricing, customers, Eucalyptus.

UNIT IV :

Platform as a Service(PaaS): Introduction to PaaS,What is PaaS, Service Oriented Architecture (SOA),Cloud Platform and Management, Computation Storage Examples Google App Engine Microsoft Azure, SalesForce.com's Force.com platform.

UNIT V: Software as a Service(SaaS):
Introduction to SaaS, Web services, Web 2.0,Web OS, Case Study on SaaS

UNIT VI: Service Management in Cloud Computing: Service Level Agreements(SLAs),Billing & Accounting, Comparing Scaling Hardware: Traditional vs. Cloud, Economics of scaling: Benefitting enormously, Managing Data, Looking at Data, Scalability & Cloud Services, Database & Data Stores in Cloud, Large Scale Data Processing

Text Books:

	Title	Edition	Author	Publisher
1	Cloud Computing Bible,		Barrie Sosinsky,	Wiley-India, 2010
2	Cloud Computing: Principles and Paradigms,		Rajkumar Buyya, James Broberg, Andrzej M. Goscinski,	Wile, 2011

Reference Book:

	Title	Edition	Author	Publisher
1	Cloud Computing: Principles, Systems and Applications		Nikos Antonopoulos, Lee Gillam,	Springer, 2012
2	Cloud Security: A Comprehensive Guide to Secure Cloud Computing,		Ronald L. Krutz, Russell Dean Vines,	Wiley-India, 2010

VI Semester

ITM111	Big Data Analytics			L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
*Best Two out of three MSE's would be considered	15	15	15	30	40	100	3 Hrs
Prerequisites							

Course Objective

Students should be able to

1. Understand the need of Big Data, challenges and different analytical architectures
2. Learn Installation and understanding of Hadoop Architecture and its ecosystems

Course Outcome

Students will be able to

1. Discuss the challenges and their solutions in Big Data
2. Understand and work on Hadoop Framework and eco systems.
3. Explain and Analyze the Big Data using Map-reduce programming in Hadoop framework.
4. Learn to build and maintain reliable, scalable, distributed systems with Apache Hadoop

UNIT I : Introduction To Big Data

Data Storage and Analysis - Characteristics of Big Data – Big Data Analytics - Typical Analytical Architecture – Requirement for new analytical architecture – Challenges in Big Data Analytics – Need of big data frameworks.

UNIT II : Introduction Hadoop

Big Data – Apache Hadoop & Hadoop EcoSystem – Moving Data in and out of Hadoop – Understanding inputs and outputs of MapReduce - Data Serialization

UNIT III : Hadoop Architecture

Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands , Anatomy of File Write and Read., NameNode, Secondary NameNode, and DataNode, Hadoop MapReduce paradigm, Map and Reduce tasks, Job, Task trackers - Cluster Setup – SSH & Hadoop Configuration – HDFS Administering –Monitoring & Maintenance.

UNIT IV : **Hadoop Ecosystem And YARN**

Hadoop ecosystem components - Schedulers - Fair and Capacity, Hadoop 2.0 New Features- NameNode High Availability, HDFS Federation, MRv2, YARN, Running MRv1 in YARN.

UNIT V: HIVE AND HIVEQL, HBASE :
Hive Architecture and Installation, Comparison with Traditional Database, HiveQL - Querying Data - Sorting And Aggregating, Map Reduce Scripts, Joins & Subqueries, HBase concepts- Advanced Usage, Schema Design, Advance Indexing - PIG, Zookeeper - how it helps in monitoring a cluster, HBase uses Zookeeper and how to Build Applications with Zookeeper.

UNIT VI: Data Analytics with R, Machine Learning: Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering. Big Data Analytics with BigR.

Text Books:

	Title	Edition	Author	Publisher
1	Understanding Big data		Chris Eaton, Dirk deroos et al.	McGraw Hill, 2012.
2	HADOOP: The definitive Guide		Tom White	O Reilly 2012.

Reference Book:

	Title	Edition	Author	Publisher
1	Big Data Analytics with R and Haoop		Vignesh Prajapati	Packet Publishing 2013.
2	Big Data Analytics		Seema Acharya, Subhasini Chellappan	Wiley 2015

VI Semester

ITM112	Lab : Big Data Analytics			L= 0	T = 0	P = 1	Credits = 1
Evaluation Scheme	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
*Best Two out of three MSE's would be considered	15	15	15	60	40	100	3 Hrs
Prerequisites							

Course Objective	**Course Outcome**
Students should be able to Analyse and implement different frame work tools by taking sample data sets	Students will be able to Illustrate and implement the concepts by taking an application problem.

Sr.	Practical Title
1	To understand the overall programming architecture using Map Reduce API
2	(i)Perform setting up and Installing Hadoop in its two operating modes: • Pseudo distributed, • Fully distributed. (ii) Use web based tools to monitor your Hadoop setup
3	Store the basic information about students such as roll no, name, date of birth , and address of student using various collection types such as List, Set and Map
4	(i) Implement the following file management tasks in Hadoop: • Adding files and directories • Retrieving files • Deleting files ii) Benchmark and stress test an Apache Hadoop cluster
5	Basic CRUD operations in MongoDB
6	Retrieve various types of documents from students collection
7	To find documents from Students collection
8	Develop Map Reduce Work Application
9	Creating the HDFS tables and loading them in Hive and learn joining of tables in Hive

10	Write a Map Reduce program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather large volume of log data, which is a good candidate for analysis with MapReduce, since it is semi structured and record-oriented. Data available at: https://github.com/tomwhite/hadoopbook/ tree/master/input/ncdc/all. • Find average, max and min temperature for each year in NCDC data set? • Filter the readings of a set based on value of the measurement, Output the line of input files associated with a temperature value greater than 30.0 and store it in a separate file.

Text Books:

	Title	Edition	Author	Publisher
1	Understanding Big data		Chris Eaton, Dirk deroos et al.	McGraw Hill, 2012.
2	HADOOP: The definitive Guide		Tom White	O Reilly 2012.

Reference Book:

	Title	Edition	Author	Publisher
1	Big Data Analytics with R and Haoop		Vignesh Prajapati	Packet Publishing 2013.
2	Big Data Analytics		Seema Acharya, Subhasini Chellappan	Wiley 2015

VI Semester

ITM113	**Cloud Security**			L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme *Best Two out of three MSE's would be considered	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
	15	15	15	30	40	100	3 Hrs
Prerequisites							

Course Objective

Students should be able to

1. Understand current security standards, protocols, and best practices intended for delivering Cloud based enterprise IT services
2. Learn Architectural and design approaches to designing secure cloud services
3. Applying industry security standards, regulatory mandates, audit policies and compliance requirements
4. Survey on Cloud vendor security implementations and compliance

Course Outcome

Students will be able to

1. Describe cloud security architectures from the perspectives of: providers, brokers, carriers, and auditors.
2. Describe a methodology for orchestrating a cloud ecosystem.
3. Understand how cloud computing changes the traditional enterprise security considerations compared to on-premise.
4. How shared security responsibilities change in each service model.

UNIT I :

Introduction: Cloud Computing Defined ,The SPI Framework for Cloud Computing ,The Traditional Software Model ,The Cloud Services Delivery Model ,Cloud Deployment Models, Key Drivers to Adopting the Cloud ,The Impact Of Cloud Computing on users, Governance in the Cloud, Barriers to Cloud Computing Adoption in the Enterprise.

UNIT II :

Infrastructure Security: Infrastructure Security: the Network Level, Infrastructure Security: The Host Level, Infrastructure Security: The Application Level

SECURITY AND STORAGE : Aspects Of Data Security, Data Security Mitigation, Provider Data and Its Security.

UNIT III :

Identity And Access Management: Trust Boundaries and IAM ,why IAM? ,IAM Challenges, IAM Definitions IAM Architecture and Practice ,Getting Ready for the Cloud ,Relevant IAM Standards and protocols for Cloud Services, IAM practices in the Cloud ,Cloud Authorization Management, Cloud Service provider IAM practice ,Guidance

UNIT IV :

Security Management In The Cloud: Security Management Standards ,Security Management in the Cloud ,Availability Management ,SaaS Availability Management, PaaS Availability Management, laaS Availability Management ,Access Control ,Security Vulnerability, patch, and Configuration Management , Cloud Service provider IAM practice

UNIT V:

Privacy : What Is Privacy?, What Is the Data Life Cycle?, What Are the Key Privacy Concerns in the Cloud? ,Who is Responsible for protecting Privacy? ,Changes to Privacy Risk Management and Compliance in Relation to Cloud Computing and Regulatory Implications, U.S. Laws and Regulations , International Laws and Regulations

UNIT VI:

Audit And Compliance : Internal Policy Compliance Governance, Risk, and Compliance (GRO Illustrative Control Objectives for Cloud Computing CSp-Specific Objectives Additional Key Management Control Objectives Control Considerations for CSP users Regulatory/ExternaI Compliance Other Requirements Cloud Security Alliance Auditing the Cloud for Compliance Summary EXAMPLES OF CLOUD SERVICE PROVIDERS Amazon Web Services (laaS) Google (SaaS, PaaS) Microsoft Azure Services Platform (PaaS) proofpojnt (SaaS, laaS) RightScale (laaS) Salesforce.com (SaaS, PaaS) Sun Open Cloud Platform Workday

Text Books:

	Title	Edition	Author	Publisher
1	Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance	1st Edition	Tim Mather, SubraKumaraswamy, ShahedLatif	O'Reilly Media
2	Cloud Security	1st Edition	Ronald L. Krutz, Russell Dean Vines	O'Reilly Media

Reference Book:

	Title	Edition	Author	Publisher
1	Securing the Cloud	1st Edition	R. Winkler	IT resolution Press
2	The NIST Definition of Cloud Computing	1st Edition	Peter Mell, Timothy Grance	IT resolution Press

VI Semester

ITM114	**Lab. : Cloud Security**			L= 0	T = 0	P = 1	Credits = 1
Evaluation Scheme *Best Two out of three MSE's would be considered	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
	15	15	15	60	40	100	3 Hrs
Prerequisites							

Course Objective

Students should be able to

1. Understand current security standards, protocols, and best practices intended for delivering Cloud based enterprise IT services
2. Learn Architectural and design approaches to designing secure cloud services
3. Applying industry security standards, regulatory mandates, audit policies and compliance requirements
4. Survey on Cloud vendor security implementations and compliance

Course Outcome

Students will be able to

1. Describe cloud security architectures from the perspectives of: providers, brokers, carriers, and auditors.
2. Describe a methodology for orchestrating a cloud ecosystem.
3. Understand how cloud computing changes the traditional enterprise security considerations compared to on-premise.
4. How shared security responsibilities change in each service model.

Exp. No	Name of Experiment
1	Working and Implementation of Infrastructure as a service
2	Working and Implementation of Software as a service
3	Working and Implementation of Platform as a services
4	Practical Implementation of Storage as a Service
5	Working of Google drive to make spreadsheet and notes
6	Working and Implementation of identity management
7	Write a program for web feed
8	Execute the step to Demonstrate and implementation of cloud on single sign on
9	Practical Implementation of cloud security.10.Installing and Developing Application Using Google App Engine

10	Implementation of Cloud Failure Cluster

Text Books:				
	Title	**Edition**	**Author**	**Publisher**
1	Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance	1st Edition	Tim Mather, SubraKumaraswamy, ShahedLatif	O'Reilly Media
2	Cloud Security	1st Edition	Ronald L. Krutz, Russell Dean Vines	O'Reilly Media
Reference Book:				
	Title	**Edition**	**Author**	**Publisher**
1	Securing the Cloud	1st Edition	.R. ("Vic") Winkler	IT resolution Press
2	The NIST Definition of Cloud Computing	1st Edition	Peter Mell, Timothy Grance	IT resolution Press

VII Semester

ITM121	Cloud Application Development using Salesforce			L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme *Best Two out of three MSE's would be considered	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
	15	15	15	30	40	100	3 Hrs
Prerequisites							

Course Objective

Students should be able to

1. Study the Cloud Computing components
2. Cloud Computing fundaments and Force.com platform
3. Storage management in cloud environment
4. Storage Solution in cloud architecture

Course Outcome

Students will be able to

1. Analyse the components of cloud computing
2. To Understand Cloud Computing Fundamental and Forece.com platform
3. Evaluate information storage management design in a cloud environment and how it relates to the business objectives of an organization
4. Analyse the role technology plays in the design of a storage solution in a cloud architecture

UNIT I : CLOUD COMPUTING FUNDAMENTALS

Cloud Computing definition, private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public vs private clouds, role of virtualization in enabling the cloud; Business Agility: Benefits and challenges to Cloud architecture. Application availability, performance, security and disaster recovery; next generation Cloud Applications

UNIT II : CLOUD APPLICATIONS

Technologies and the processes required when deploying web services; Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages

UNIT III : Introducing the Force.com Platform. - Introduction to the Force.com Platform. The Basics of an App's User Interface. The Benefits of a Force.com Data-Centric, Collaborative Apps, The Technologies Behind a Force.com Platform App, Multitenant Architecture, A Metadata-Driven

Development Model, Apex . Custom User Interface Mobile, AppExchange.

UNIT IV : Objects and Tabs: Introduction to Objects , ,Introduction to Fields , Introduction to Picklists , Field Dependencies , Dependent Picklist ,Custom Formula Fields , Dynamic Default Values , Validation Rules, Page Layouts , Page Layout Editor Group Fields Edit Field Properties , Page Layouts , Compact Layouts.

UNIT V: Relationships: Introduction to Relationship Custom Fields, Page Layout Properties, Record Highlights, Introduction to Search Layouts, Introduction to Roll-Up Summary Fields, Many-to-Many Relationship.

UNIT VI: Securing and Sharing Data: Controlling Access to Data in App, Data Access Concepts. Co, Introduction to Profiles, ,Introduction to Field-Level Security , Introduction to Hierarchies , Introduction of Sharing Rules , Introduction to Manual Sharing , Manual Sharing Rule.

Text Books

Sr. No	Title	Authors	Publisher
1	Force.com Platform Fundamentals An Introduction to Custom Application Development in the Cloud	Phil Choi Chris McGuire Caroline Roth	salesforce.com
2	Salesforce Handbook Paperback	Wes Nolte , Jeff Douglas	Publisher: Lulu.com
3	REST in Practice	Jim Webber, Savas Parastatidis, Ian Robinson	O'Reilly Media; 1 edition, [ISBN: 978-0596805821] 2010.
4	Developing Applications for the Cloud on the Microsoft Windows Azure Platform	Eugenio Pace, Dominic Betts, Scott Densmore, Ryan Dunn, Masashi Narumoto, MatiasWoloski	Microsoft Press; 1 edition, [ISBN: 9780735656062] 2010
Reference Books			
1	Salesforce CRM: The Definitive Admin Handbook Paperback	Paul Goodey,	2nd edition Publisher: Packt Publishing Limited;

VII Semester

ITM122	Lab : Cloud Application Development using Salesforce			L= 0	T = 0	P = 1	Credits = 1
Evaluation Scheme	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
*Best Two out of three MSE's would be considered	15	15	15	60	40	100	3 Hrs
Prerequisites							

Course Objective

Students should be able to

1. To study the Cloud Computing components
2. Cloud Computing fundaments and Force.com platform
3. Storage management in cloud environment
4. Storage Solution in cloud architecture

Course Outcome

Students will be able to

1. Analyse the components of cloud computing
2. To Understand Cloud Computing Fundamental and Forece.com platform
3. Evaluate information storage management design in a cloud environment and how it relates to the business objectives of an organization
4. Analyse the role technology plays in the design of a storage solution in a cloud architecture

S.No	Title of Practical
1	Configure Hyper-V • Create and configure virtual machine settings. • Create and configure virtual machine storage. • Create and configure virtual networks.
2	Configure and Manage Virtual Machine High Availability • Configure failover clustering with Hyper-V. • Manage failover clustering roles. • Manage virtual machine movement.
3	Implement a Server Virtualization Infrastructure • Implement virtualization hosts. • Implement virtual machines. • Implement virtualization networking. • Implement virtualization storage. • Manage and maintain a server virtualization infrastructure.
4	Monitor and Maintain a Server Virtualization Infrastructure • Plan and implement a monitoring strategy. • Plan and implement a business continuity and disaster recovery solution. • Industry Leading VeeamOne & VeeamBackup Solution

Text Books			
Sr. No	Title	Authors	Publisher
1	Force.com Platform Fundamentals An Introduction to Custom Application Development in the Cloud	Phil Choi Chris McGuire Caroline Roth	salesforce.com
2	Salesforce Handbook Paperback	Wes Nolte , Jeff Douglas	Publisher: Lulu.com
3	REST in Practice	Jim Webber, Savas Parastatidis, Ian Robinson	O'Reilly Media; 1 edition, [ISBN: 978-0596805821] 2010.
4	Developing Applications for the Cloud on the Microsoft Windows Azure Platform	Eugenio Pace, Dominic Betts, Scott Densmore, Ryan Dunn, Masashi Narumoto, MatiasWoloski	Microsoft Press; 1 edition, [ISBN: 9780735656062] 2010
Reference Books			
1	Salesforce CRM: The Definitive Admin Handbook Paperback	Paul Goodey,	2nd edition Publisher: Packt Publishing Limited;

YESHWANTRAO CHAVAN COLLEGE OF ENGINEERING
(An Autonomous Institution affiliated to R T M Nagpur University Nagpur)
Accredited by NAAC (1st Cycle) with 'A' Grade (Score 3.25 on 4 Point Scale)
Wanadongri, Hingna Road, Nagpur-441110

Department of General Engineering
(Minor in CM)

B.E. Minor in Corporate Management
SoE & Syllabus 2022-23

Information Brochure of Minor Program

1. Title of Program: **Corporate Management**

2. Type of Program : **Minor**

3. Department offering the program: **Applied Mathematics and Humanities**

4. Industry / Association / Collaboration: **Datta Meghe Institute of Management studies (DMIMS), Atrey layout, Nagpur**

5. Department/s eligible to opt for the program: **The students from all the departments i.e. CV, EL, ME, EE, ETC, CT, IT, CSE are eligible to opt for this program.**

6. General information about courses in program:

Corporate Management subject involves conceiving, initiating and bringing together the various business elements and help the learner to integrate the diverse organizational component while sustaining the viability of the organization towards some predetermined goal.

The syllabus of the course is structured in such a manner to give students in-depth knowledge about **Entrepreneurship Development**- It will develop and strengthen entrepreneurial quality and motivation, **Industrial Relation and Legislation**- It will help the students to understand and apply the concept of Industrial Relations and the system in which it operates, **Production and Operation Management**- This will emphasizes the concepts and practices of managing production and operations in contemporary organizations, **Financial Accounting**- This will help students to understand various concepts and aspects of accounting and will help them to analyze financial statement using ratio analysis, **Market Research** – This will help students to develop an attitude and aptitude for research by way of doing Project and **Brand Development –** This will make sure that students understand implications of planning, implementing and evaluating branding strategies

7. Advance knowledge or research orientation of Program:

This course has both theoretical and practical orientation and will equip the students with knowledge and different perspective required to start business or work at the corporate / Organization and will provide good career start and will leads to a wide scope for career development and skills

8. Employability potential of program:

The skills gain on Corporate Management will equip the students to understand the potential of starting business and /or to contribute to Employers organization effectively and they have a brighter chance to get hired to post wherein technical and administrative skills are required and will facilitate the students to get higher promotion and rank quickly

9. Departmental Steering committee: For proper publicity / conduct of program

SN	Name of the Faculty Member	Post	Designation	e-mail ID	Contact Number
1	Dr.M.P.Gandhi	Chairman	Associate Professor	hod_mths@ycce.edu	9421780188
2	Dr.Arvinder Kour	Member Secretory	Assistant Professor	Aru.akm@gmail.com	9158886500
3	Prof. Shrikant Ashtankar	Member	Assistant Professor	shrikantashtankar27@gmail.com	9970070278
4	Prof. D.P.Bawane	Member	Assistant Professor	dnyanesh02@gmail.com	9423673952

10. Program Coordinator:

SN	Name of the Faculty Member	Post	Designation	e-mail ID	Contact Number
1	Dr.Arvinder Kour	Coordinator	Assistant Professor	aru.akm@gmail.com	9158886500

Scheme of Examinations
Minor in Corporate Management

SN	Se	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
					L	T	P	H		MSEs	TA*	ES	
1	V	GEM101	Entrepreneurship Development	T	3	0	0	3	3	30	30	40	3
2	V	GEM102	Industrial Relation and legislation	T	3	0	0	3	3	30	30	40	3
3	VI	GEM111	Production and Operation Management	T	3	0	0	3	3	30	30	40	3
4	VI	GEM112	Financial Accounting	T	3	0	0	3	3	30	30	40	3
5	VI	GEM113	Market Research Project Work *	T	0	3	0	3	3	--	--	---	--
6	VII	GEM121	Brand Development	T	3	0	0	3	3	30	30	40	3
		Total			**18**	**0**	**0**	**18**	**18**				

MSEs* = Three MSEs of 15 Marks each will conducted and marks of better 2 of these 3 MSEs will be considered for Continuous Assessment

*Market Research Project Work: Rubrics: % Weightage of Marks

End Semester Internal Project Evaluation – 60 Marks

Viva – 40 Marks

Total = 100 Marks

TA ** = for Theory : 20 marks on lecture quizzes, 8 marks on assignments, 2 marks on class performance

TA = for Practical : MSPA will be 15 marks each**

V Semester

GEM101	ENTREPRENEURSHIP DEVELOPMENT			L=3	T=0	P=0	Credits=3
Evaluation Scheme	MSEs	TA	ESE	Total	ESE Duration		
	30	30	40	100	3 Hrs		

Objective	Outcomes Students will be able to
• To develop and strengthen entrepreneurial quality and motivation amongst the students.	• Appreciate role of intrapreneurs and entrepreneurs in society. • Innovate, prototypes or ideas by applying theory into practice. • Explain process of setting up of service unit/industry. • Develop and complete a comprehensive business plan.

Unit I: Entrepreneur &Entrepreneurship:

Meaning of entrepreneur - Evolution of the concept - Functions of an Entrepreneur - Types of Entrepreneur - Intrapreneur- an emerging class - Concept of Entrepreneurship - Evolution of Entrepreneurship - Development of Entrepreneurship - Entrepreneurial Culture - Stages in entrepreneurial process**. (6 hours)**

Unit II: Business Planning Process:

Meaning of business plan - Business plan process - Advantages of business planning - Marketing plan - Production/operations plan - Organization plan - Financial plan - Final Project Report with Feasibility Study - preparing a model project report for starting a new venture. **(7 Hours)**

Unit III: Institutions supporting Entrepreneurs:

Role of Central Government and State Government in promoting Entrepreneurship - Introduction to various incentives, subsidies and grants - Export Oriented Units - Fiscal and Tax concessions available

Role of following agencies in the Entrepreneurship Development - District Industries Centers (DIC), Small Industries Service Institute (SISI), Entrepreneurship Development Institute of India (EDII), National Institute of Entrepreneurship & Small Business Development (NIESBUD), National Entrepreneurship Development Board (NEDB) Prime Minister Employment Generation Programme (PMEGP) **(6 Hours)**

UNIT IV:

Quality Management

Quality-Concepts & tools, Cause and effect Diagram, Control Chart ISO 9000 System, Importance and need for Quality Systems, Management Responsibility, Quality System Certification Procedure **(6hours)**

UNIT V:

Informal Risk Capital and Venture Capital: Informal risk capital market - venture capital - nature and overview - venture capital process - locating venture capitalists - approaching venture capitalists. Social Entrepreneurship: Social enterprise-need - types - characteristics and benefits of social enterprises-

Social entrepreneurship - Rural entrepreneurship, MSME Policies. Make-In India, Start-Up India, Stand-Up India**.(6 Hours)**

UNIT V: Case studies

Case study of Successful Entrepreneurial Ventures, Failed Entrepreneurial Ventures and Turnaround Ventures **(6 hours)**

Student activities:

1. Interview at least four entrepreneurs or businessman and identify Traits of successful entrepreneurs.
2. Analyse case studies of any two successful entrepreneurs.
3. Download product development and innovative films from internet.
4. Identify your hobbies and interests and convert them into business idea

Reference Books:

SN	Title	Authors	Publisher
1	Entrepreneurship and Small Business Management	S.S. Khanka	Sultanchand and Sons
2	Protect Preparation, Appraisal, Implementation	Prasanna Chandra	Tata McGraw Hill. New Delhi
3	Entrepreneurship Development	S Anil Kumar	New Age International Publishers
4	Entrepreneurship Development	Nishith Dubey	PHI Learning

V Semester

GEM102	INDUSTRIAL RELATION AND LEGISLATION			L=3	T=0	P=0	Credits=3
Evaluation Scheme	MSEs	TA	ESE	Total	ESE Duration		
	30	30	40	100	3 Hrs		

Objective	Outcomes Students will be able to
• The course helps the student understand and apply the concept of industrial relations and the system in which it operates.	• Acquaint themselves with the concepts, principles and issues connected with trade unions, collective bargaining, workers participation, • Understand law with respect to : Industrial Legislation, Industrial Workers Legislation and Industrial Wage Legislation

Industrial Relations & Legislations

Unit-1- Introduction of Industrial Relations
Background of Industrial Relations – Definition, scope, objectives, factors affecting IR, participants of IR, importance of IR. ILO and its influence on Legal enactments in India. (5 HOURS)

Unit -2-Collective Bargaining & Negotiation
Collective Bargaining: Definition, Meaning, functions of collective bargaining, importance of Collective Bargaining, **Negotiations**-Types of Negotiations-, Techniques of negotiation, Workers Participation in Management (5 HOURS)

Unit-3-Trade Union
Trade Unions: Meaning, Procedure for registration of Trade Unions, Grounds for the withdrawal and cancellation of registration, union structure, Rights and responsibilities of TUs, Problems of trade unions, Employee relations in IT sector **(5 HOURS)**

Unit-4-Industrial Legislation :
Only basic objectives and major provisions of the following legislations:

- Factories Act 1948,
- Industrial disputes act of 1947
- Industrial Employment (Standing orders) Act, 1946
- Employees' State Insurance (ESI) Act, 1948, **(7 HOURS)**

Unit – 5- Industrial Workers Legislation
Only basic objectives and major provisions of the following legislations:

- Maternity Benefit Act, 1961
- Contract Labour Act,
- Shops and Establishments Act
- Child Labour (Prohibition & Regulation) Act, 1986**(7 HOURS)**
-

Unit – 6- Industrial WageLegislation
Only basic objectives and major provisions of the following legislations:

- Minimum Wages Act, 1948
- Payment of Wages Act, 1936
- Payment of Gratuity Act 1972,
- Employees' Provident Fund and Miscellaneous Provisions Act 1952;
- Payment of Bonus Act, 1965.
- Employees Compensation Act in 2013 **(7 HOURS)**

REFERENCE BOOKS:

1. T. N. Chabra, R.K. Suri, " Industrial Relations- Concepts and Issues", 2000, Dhanpat Rai & Co. Private Ltd.,

2. CB Mamoria, Satish Mamoria and S V Gankar, " Dynamics of Industrial Relations", Himalaya Publishing House, 2008

3. S C Srivatsava, "Industrial Relations and Labour Laws", 2008, Vikas Publishing House

4. C S Venkatratnam, " Industrial Relations", 2009, OUP

5. Bare Acts of : Factories Act 1948,

- Industrial disputes act of 1947
- Industrial Employment (Standing orders) Act, 1946
- Employees' State Insurance (ESI) Act, 1948
- Maternity Benefit Act, 1961
- Contract Labour Act,
- Shops and Establishments Act
- Child Labour (Prohibition & Regulation) Act, 1986
- Minimum Wages Act, 1948
- Payment of Wages Act, 1936
- Payment of Gratuity Act 1972,
- Employees' Provident Fund and Miscellaneous Provisions Act 1952;
- Payment of Bonus Act, 1965.
- Employees Compensation Act in 2013

VI Semester

GEM111	PRODUCTION AND OPERATION MANAGEMENT			L=3	T=0	P=0	Credits=3
Evaluation Scheme	MSEs	TA	ESE	Total	ESE Duration		
	30	30	40	100	3 Hrs		

Objective	Outcomes Students will be able to
• This course emphasizes the concepts and practices of managing production and operations in contemporary organizations. This course provides an introduction to the field of production and operations management.	• Gain knowledge about managing production processes. • Understand to run operations effectively. • Better understanding of modern production Planning and control. • Better understanding of Plant Layout and Inventory Management and quality management. • Understanding supply chain management, Management skills needed for the effective operations management.

UNIT-I : Introduction:

Production and Operations Management: Meaning, Definitions, Scope and Evolution –Role of Operations Management in Total Management System (6 hours)

UNIT-II: Production Planning and Control:

Basic functions of Production Planning & Control –Production–Characteristics of Process technologies – Interrelationship between Product Life Cycle and Process Life Cycle .(6 hours)

UNIT-III: Plant Layout and Inventory Management :

Lay Out facilities –Different types of layouts –Location Concept –Factors influencing the Plant Location –Group and Static Product layout –Plant Capacity and Line Balancing, Strategies for Inventory Management (6 hours)

UNIT-IV: Quality Control:

Standards and specifications –Quality Assurance and Quality Circles –Statistical Quality Control – Control Charts for Average, Range, Fraction defective and number of defects.(6 hours)

Unit -V-Supply Chain Management :

Introduction, Domain Applications, SCM– The Breakthrough Article, Supply Chain Management, Views on Supply Chain, Bullwhip Effect in SCM, Collaborative Supply Chain, Inventory Management in Supply Chain, Financial Supply Chain – A New Revolution within the SCM Fold (6 hours)

UNIT-VI: Materials And Maintenance Management:

Need and Importance of Material s Management-Materials Requirement Planning –Sources of Supply of Materials –Work Study –Techniques of Work study –Method Study –Work Measurement –Its Uses and different methods.(5 hours)

References:

1. Buffa E .S , Modern Production Management, John Wiley, New York; 19732.
2. Evertt Adam &RonaalJ.Ebert , Production and Operations Management, PHI, 199
3. C.B.Gupta ,Production Management, S.Chand Co.
4. Sridharan Bhatt & Aswathappa: Production and Operations Management HPH
5. O.P.Khanna, Operations Management.

VI Semester

GEM112	FINANCIAL ACCOUNTING			L=3	T=0	P=0	Credits=3
Evaluation Scheme	MSEs	TA	ESE	Total	ESE Duration		
	30	30	40	100	3 Hrs		

Objective	Outcomes Students will be able to
• To make the students aware of the various aspects of accounting. • The students will also learn the basic concepts of accounting. • They will also understand Final Accounts. • The students will also be able to analyse financial statement using ratio analysis.	• Understand Accounting concepts, conventions & principles • Apply Accounting concepts & principles in practical spheres. • Prepare various books of accounts and financial statements. • Analyse the Financial Statement and draw conclusions

Unit I: Introduction

Meaning and Definition of Accounting –Need of Accounting for business decisions Objectives of Preparation of Accounts —Users of Accounting Information -Classification of Accounts –Rules of Debit and Credit

Numericals on-Classification of Accounts& Debit Credit Rules (4 hours)

Unit II: Preparation of Books of Account

Accounting Cycle – Journal, Posting of transaction into Ledger and Preparation of Trial Balance

Numericals on- Journalizing Transactions, Ledger posting & Preparing Trial balance **(8 Hours)**

Unit III: Preparation of Financial Statements:

Preparation and Presentation of Final Accounts -Trading Account, Profit and Loss Account, Balance Sheet-as pre the Provisions of Company's Act, 2013

Numericals on- Preparation of Final accounts **(8 hours)**

UNIT IV: Financial Statement Analysis I:
Ratio Analysis: Meaning, Importance, Uses of ratios in Finance. Methods of calculation and application of Liquidity ratios, Activity Ratios, Solvency ratios & Profitability ratios, Numerical on-Calculation of Ratios**(8 hours)**

UNIT V: Financial Statement Analysis II
Cash Flow Analysis: Meaning of Cash Flow Statement, Cash flow from operating activities, Cash flow from investing activities, Cash flow from financing activities
Numerical on- preparation ofCash Flow Statement

UNIT VI Fund Flow Statement: Meaning and objective of Fund Flow Statement; Preparation of Schedule of Changes in Working Capital; Statement of Fund From Operation, Statement of Sources and Application of Funds

(7 hours)

Reference Books:

SN	Title	Edition	Authors	Publisher
1	**Advance Accountancy**		**Shukla&Garewal**	**S Chand Publication**
2	**Financial, Cost and Management Accounting**	**2nd Edition**	**Dr. P. Periasamy**	**Himalaya Publishing House**
3	**Fundamentals of Accountancy**		**ChoudharyChopade**	**Sheth Publication**
4	**Accountancy**		**Dr. P.C. Tulsian**	**Taxman Publication**

VI Semester

GEM113	MARKET RESEARCH- PROJECT WORK	L=0	T=3	P=0	Credits=3
Evaluation Scheme	The Project work will be evaluated by the project guide. The Students will be examined by the external examiner and the project guide. Marks will be allotted on the basis of work done, Project work prepared and viva voce.				

Objective	Outcomes Students will be able to
• To develop an attitude and aptitude for research	1. Identify a issue and derive problem related to society, environment, economics, energy and technology 2. Formulate and Analyze the problem and determine the scope of the solution chosen 3. Determine , dissect, and estimate the parameters, required in the solution. 4. Evaluate the solution by considering the standard data / Objective function and by using appropriate performance metrics. 5. Compile the report and take part in present / publishing the finding in a reputed conference / publications

VII Semester

GEM121	Brand Management			L=3	T=0	P=0	Credits=3
Evaluation Scheme	MSEs	TA	ESE	Total	ESE Duration		
	30	30	40	100	3 Hrs		

Objective	Outcomes Students will be able to
• **Brand Management syllabus** is to make sure that students understand implications of planning, implementing and evaluating **Branding** Strategies	1. Develop a consumer-centric approach to building, measuring and evaluating strategies that build brand equity for new and existing brands. 2. Identify important issues related to planning and implementing brand strategies for a diverse group of marketing offerings 3. Learn how to identify brand meaning and to measure brand strength for any particular market offering. 4. Apply branding principles and marketing communication concepts and frameworks to achieve brand management goals and improve marketing performance.

Unit I: Introduction to Brand

Inroduction, Product –Vs-Brand, Strategy for brand management, Brand Architecture, Designing Brand Architecture,Entrepreneurial Environment **(5 Hours)**

Unit II – Brand identity, Brand Personality

Introduction, Brand identity, Brand personality,David Aaker's Model, Kapferer's Model **(5 hours)**

Unit III: Positioning

Brand Positioning, Basics of brand positioning, Brand Positioning Statement – Guidelines, Brand Repositioning,Brand positioning vs Product Positioning **(6 hours)**

UNIT IV: Brand communication

Overview, Importance of communication, Brand Awareness,Brand Image **(7 hours)**

UNIT V: Consumer Based Brand Equity

Overview, What is brand equity, The CBBE Pyramid, Five Tenets of Brand Building, Brand Management Framework **(7 hours)**

Unit VI : Case studies

Case study of Successful Brand, Assessment of product cycle, Approaches of various successful group and their strategy, Examination of criteria and success of Brand

Students Activities

- Go to a supermarket and find the brand elements in various brands of soaps, mobiles, jeans, and other products•
- Pick up your college, analyze its positioning and how would you reposition it?
- Pick a multiproduct company and as completely as possible analyze its brand portfolio and brand extensions?
- Consider some groups like Tata's , Birla's, Infosys etc – what is their branding strategy
- Students are supposed to assess the product life cycle and appraise alternative approaches to luxury brand management.
- Students can select any two popular brands and identify and examine the criteria for success in the luxury brand industry.

Text Books:

- Strategic Brand Management – Kevin Keller (K.K.), Pearson Education
- Advanced brand management by Paul Temporal, John Wiley & Sons (Asia)
- Brand Building Advertising, Concepts and Cases (Casebook II) – M.G. Parameshwaran, Kinjal Medh, Tata McGraw Hill Education Pvt. Ltd
- Strategic Brand Management, Creating & Sustaining Brand Equity Long term – Jean Noel Kapferer, 2nd Edition, Kogan Page
- Building Strong Brands – David A. Aaker, Free Press

YESHWANTRAO CHAVAN COLLEGE OF ENGINEERING
(An Autonomous Institution affiliated to R T M Nagpur University Nagpur)
Accredited by NAAC (1st Cycle) with 'A' Grade (Score 3.25 on 4 Point Scale)
Wanadongri, Hingna Road, Nagpur-441110

Department of General Engineering
(Minor in G&FL)

B.E. Minor in German and French Languages SoE & Syllabus 2022-23

B.E Minor in German and French Languages

Information Brochure of Minor Program

1. Title of Program: German and French Languages

2. Type of Program : Minor

3. Department offering the program: Applied Mathematics and Humanities

4. Industry / Association / Collaboration:
   Innovinc Services 144, Gupte House, Pandey Layout, Khamla, Nagpur – 440025 (M.S) (India) www.innovinc-services.com

5. Department/s eligible to opt for the program: **The students from all the departments i.e. CV, EL, ME, EE, ETC, CT, IT, CSE are eligible to opt for this program.**

6. General information about courses in program:
   The course that we have designed is to cover A1 level of Foreign Language. A1 language level contains basic grammar and vocabulary for simple conversations.

A1 level speaker:

- Can understand and use familiar, everyday expressions and very simple sentences, which relate to the satisfying of concrete needs.
- Can introduce him/her and others as well as ask others about themselves – e.g. where they live, who they know and what they own – and can respond to questions of this nature.
- Can communicate in a simple manner if the person they are speaking to speaks slowly and clearly and is willing to help.

So, in other words, with A1 you are at the level of "Hello, my name is X. I am from Y. Could you please tell me which subway goes to the airport? I am sorry, could you say this again, please, and speak a bit slower?"

- You learn how to make **simple enquiries** in speaking and writing
- You learn how to **give instructions.**
- You build on your **basic grammar skills**
- You learn **basic vocabulary**

- Asking the way; giving directions; asking for and giving information; discussing home and the household; describing people and their character; defining shape, size and color of objects; asking for and giving opinions; the working world; returning faulty goods to a shop.

7. Employability potential of program:

Knowledge of Foreign Language increases your job opportunities with Multinational and companies in your own country and abroad. Proficiency in Foreign Language helps you to function productively for an employer with global business connections. If you move abroad, you'll be able to find some sort of job, speaking only very basic Foreign Language. As an International student in Foreign Language, such jobs are very important because they help you become independent and pay your expenses along with helping you to grow your Foreign Language skills even more.

Whoever wants a good job abroad needs to have, good command over the language, good past experience and good education. Moving abroad without Foreign Language knowledge/Work experience/formal education, chances are very low to find a good job. So with this Minor program we are preparing the students face the challenges of tomorrow with ease.

Last but certainly not the least; German Language is officially spoken in Austria, Switzerland, Luxembourg, Belgium and Liechtenstein. So a student has an option to move to these countries for employment purposes and can easily survive with German language skills he'll grasp through this program. French is spoken and used in Belgium, France, morocco and 60+ counties across the world which opens employment avenues for students in these countries

8. Departmental Steering committee:

SN	Name of the Faculty Member	Post	Designation	e-mail ID	Contact Number
1	Dr.M.P.Gandhi	Chairman	Associate Professor	hod_mths@ycce.edu	9421780188
2	Prof. Meenal Kale	Member Secretory	Assistant Professor	m_mini83@yahoo.co.in	9326041801
3	Prof. Nanda Thkare	Member	Assistant Professor	nandathakare@gmail.com	9890508884
4	Prof. Monali Dhote	Member	Assistant Professor	thakaremonali@gmail.com	9823027200

9. Program Coordinator:

SN	Name of the Faculty Member	Post	Designation	e-mail ID	Contact Number
1	Prof. Meenal Kale	Coordinator	Assistant Professor	m_mini83@yahoo.co.in	9326041801

Scheme of Examinations
Minor in German and French languages

SN	Sem	Sub.	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
					L	T	P	Hrs		MSEs*	TA**	ESE	
1	V	**GEM131**	**German for Beginners – A1.1**	**T**	3	0	0	3	3	30	30	40	3
2	V	**GEM132**	**General Proficiency in German – A1.2**	**T**	3	0	0	3	3	30	30	40	3
3	VI	**GEM141**	**Advanced Proficiency in German – A1.3**	**T**	3	0	0	3	3	30	30	40	3
4	VII	**GEM151**	**French for Beginners – A1.1**	**T**	3	0	0	3	3	30	30	40	3
5	VII	**GEM152**	**General Proficiency in French –A1.2**	**T**	3	0	0	3	3	30	30	40	3
6	VIII	**GEM161**	**Advanced Proficiency in French – A1.3**	**T**	3	0	0	3	3	30	30	40	3
					18	**0**	**0**	**18**	**18**	**180**	**180**	**240**	**18**

MSEs* = Three MSEs of 15 Marks each will conducted and marks of better 2 of these 3 MSEs will be considered for Continuous Assessment

TA ** = for Theory : 20 marks on lecture quizzes, 8 marks on assignments, 2 marks on class performance

TA = for Practical : MSPA will be 15 marks each**

V Semester

GEM131	German for Beginners – A1.1			L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme *Best Two out of three MSE's would be considered	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
	15	15	15	30	40	100	3 Hrs
Prerequisites							

Course Objective
Students should be able to

Learning Basic Vocabulary
Learning Basic Grammar Skills
Learn to build very basic sentences
Describing people, Working world and household
Understanding Small Paragraphs
Listening and Practical Exercises

Course Outcome
Students will be able to

Know about: Alphabets, Counting, Days of the Week, Time of the Day, Commonly used Greetings and Phrases.

Sentence Structure, Articles, Personal Pronouns, Verb conjugations, Helping verbs in present and past. Learning Self-introductory sentences.

Ordering in a Restaurant, Conversing in Language Courses, Talking about Countries, Asking about house/apartments and furniture items. Ability to understand Biographies of people.

Practicing listening exercises on above simple topics and making students interact with each other.

UNIT I : Learning Basic Vocabulary **(6 hours)**
Alphabets, Counting, Days of the Week, Time of the Day, Commonly used Greetings and Phrases

UNIT II : Learning Basic Grammar Skills **(7 hours)**
Learning about Sentence Structure, Gender of the nouns, Articles, Addressing First/Second/Third Person, Personal Pronouns, Verb conjugations, Helping verbs in present and past.

UNIT III : Learn to build very basic sentences **(7 hours)**
Learning Self-introductory sentences – Name, Age, Profession, Birthday etc.

UNIT IV : Describing people, working world and household **(7 hours)**
Conversing in Language Courses, Ordering in a Restaurant, Talking about Countries, Asking about house/apartments and furniture items.

UNIT V: Understanding small Paragraphs **(7 hours)** Ability to understand small paragraphs based on Biographies of people, Describing household and Apartments.
UNIT VI: Listening simple tracks and doing some speaking practice **(6 hours)** Playing CD's and practice listening exercises on various topics. Asking students to interact with each other and performing speaking exercises for Cafes/Restaurants/Courses/describing Apartments etc.

Text Books:

	Title	Edition	Author	Publisher
1	Studio D A1 Deutsch Buch	2014	Funk and Kuhn	Cornelsen Verlag (Goyal Publishers India)
2	Netzwerk Deutsch als Fremdsprache	2015	Stefanie Dengler	Goyal Publishers
	Tangram aktuell	2004	Hueber	Max Hueber Verlag

V Semester

GEM132	General Proficiency in German – A1.2			L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme *Best Two out of three MSE's would be considered	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
	15	15	15	30	40	100	3 Hrs
Prerequisites							

Course Objective

Students should be able to

Learning Advanced Vocabulary

Learning Advanced Grammar Skills

Learn to build Sentences using Advanced Vocabulary and Grammar skills

Learning more useful topics in Dad-to-Day surroundings and life

Writing very simple letters for Enquiries. Practicing Speaking of the same

Advanced Listening exercises

Course Outcome

Students will be able to

Know about: Professions, Appointments, Seasons of the Year, Colours, Family Tree.

Possessive Pronouns, Adjectives, Separable verbs, Personal pronouns, Modal Verbs, Learning Prepositions.

Taking and Agreeing to Appointments, Asking and Giving Directions, Learning about various professions.

Having enquiries at railway station, restaurant, book store. Practicing more advanced listening tracks and more speaking practice.

UNIT I : Learning Advanced Vocabulary **(6 hours)**

Professions, Appointments, Seasons of the Year, Colours, Family Tree, Learning about Tourism and Orientation etc.

UNIT II : Learning Advanced Grammar Skills **(6 hours)**

Possessive Pronouns, Adjectives, Separable verbs, Personal pronouns, Modal Verbs, Learning Prepositions etc.

UNIT III : Learn to build complex sentences using Advanced vocabulary **(7 hours)**

Practicing more about sentence structure using Modal verbs, Separable verbs, Prepositions.

UNIT IV : Learning More Useful topics in Day-to-Day surroundings and life **(7 hours)**

Taking Appointments and Agreeing to Appointments, Asking and Giving Directions, Learning about various professions, Going and coming from Vacations and Planning trips.

UNIT V: Writing very simple letters for Enquiries. Practicing Speaking of the same (7 hours)

Letter to a friend/neighbour of arriving late. Having enquiries at railway station, restaurant, book store etc. Practicing all that with speaking too.

UNIT VI: Advanced Listening exercises (7 hours)

Practicing more listening tracks for learning advanced vocabulary and Grammar skills.

Text Books:

	Title	Edition	Author	Publisher
1	Studio D A1 Deutsch Buch	2014	Funk and Kuhn	Cornelsen Verlag (Goyal Publishers India)
2	Netzwerk Deutsch als Fremdsprache	2015	Stefanie Dengler	Goyal Publishers
	Tangram aktuell	2004	Hueber	Max Hueber Verlag

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

Department of Applied mathematics and Humanities

B.E Minors in German and French Languages

SoE No. MIN-101

VI Semester

GEM141	**Advanced Proficiency in German – A1.3**			L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme *Best Two out of three MSE's would be considered	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
	15	15	15	30	40	100	3 Hrs
Prerequisites							

Course Objective

Students should be able to

Learning Advanced Vocabulary

Learning Advanced Grammar Skills

Learn to build Sentences using Advanced Vocabulary and Grammar skills

Learning more useful topics in Dad-to-Day surroundings and life

Writing advanced letters for Enquiries. Practicing Speaking of the same

Advanced Listening exercises

Course Outcome

Students will be able to

Know about: Public Transportation, Filling German Application, Learning Food and Drink items.

Learning Tenses, Present-Perfect, Using Adjectives in Accusative. Learning more complicated sentences using Tenses, Adjectives, Personal Pronouns in Accusative.

Asking prices of food and drink items in a Supermarket, Learning about Health and Fitness.

Enquiries in a Shopping Market or about Vacation planning. Practicing listening from advanced level tracks and speaking practice.

UNIT I : Learning Advanced Vocabulary **(6 hours)**

Public Transportation, Filling German Application, Learning Food and Drink items, Body parts, Clothing, Weather, Sightseeing, Health and Fitness.

UNIT II : Learning Advanced Grammar Skills **(7 hours)**

Learning Tenses, Present-Perfect, Using Adjectives in Accusative, Modal Verbs, Personal Pronouns in Accusative, Imperatives.

UNIT III : Learn to build complex sentences using Advanced vocabulary **(6 hours)**

Practicing more about sentence structure using Tenses, Adjectives, Personal Pronouns in Accusative.

UNIT IV : Learning More Useful topics in Day-to-Day surroundings and life **(7 hours)**

Asking prices of food and drink items in a Supermarket, Learning about Health and Fitness, Planning trips, Talking about Clothes and Weather.

UNIT V: Writing advanced letters for Enquiries. Practicing Speaking of the same (7 hours)

Letter to a neighbour/friend for party invitations. Enquiries in a Shopping Market or about Vacation planning etc. Practicing all that with speaking too.

UNIT VI: Advanced Listening exercises (7 hours)

Practicing more listening tracks for learning more advanced vocabulary and Grammar skills learnt in this session.

Text Books:

	Title	Edition	Author	Publisher
1	Studio D A1 Deutsch Buch	2014	Funk and Kuhn	Cornelsen Verlag (Goyal Publishers India)
2	Netzwerk Deutsch als Fremdsprache	2015	Stefanie Dengler	Goyal Publishers
	Tangram aktuell	2004	Hueber	Max Hueber Verlag

VII Semester

GEM151	French for Beginners – A1.1			L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme *Best Two out of three MSE's would be considered	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
	15	15	15	30	40	100	3 Hrs
Prerequisites							

Course Objective
Students should be able to

- Learning Basic Vocabulary
- Learning Basic Grammar Skills
- Learn to build very basic sentences
- Describing people, Working world and household
- Understanding Small Paragraphs
- Listening and Practical Exercises

Course Outcome
Students will be able to

Know about: Alphabets, Counting, Days of the Week, Time of the Day, Commonly used Greetings and Phrases.

Sentence Structure, Articles, Personal Pronouns, Verb conjugations, Helping verbs in present and past. Learning Self-introductory sentences.

Ordering in a Restaurant, Conversing in Language Courses, Talking about Countries, Ability to understand Biographies of people.

Practicing listening exercises on above simple topics and making students interact with each other.

UNIT I : Grammar I **(7 hours)**
French alphabets
Pronunciation Guide
Indefinite and definite articles
Present tense: -er verbs (regular)

UNIT II : Grammar II **(7 hours)**
etre, avoir (irregular verbs)
Nouns (singular & plural)
Adjectives
Pronouns (subject)

UNIT III : Vocabulary **(7 hours)**
Numbers (1-100)
Days of the week
Months of the year
Nationalities
Colours
Adjectives words for common use used
Nouns words for common use used

UNIT IV : Communication skills I **(6 hours)** Greetings Presentation, introduction
UNIT V: Communication skills II **(6 hours)** Interrogation relating to everyday situations Replying to simple questions.
UNIT VI: Civilisation **(7 hours)** Day to day Iife, eg. -Classroom -Friends -Family -School -Vacations Introduction to France: Geography.

Text book recommended:

	Title	Edition	Author	Publisher
1	Apprenons le frangais', Part 1	2018	Ranjit, Mahita & Singh, Monica	Saraswati House Pvt. Ltd., New Delhi. Second Revised Edition, 2007.
2	'Cahier d'exercices', (Apprenons le francais) 1.	2018	Ranjit, Mahita & Singh, Monica	Saraswati House Pvt. Ltd., New Delhi. Second Revised Edition, 2007.

VII Semester

GEM152	General Proficiency in French– A1.2			L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme *Best Two out of three MSE's would be considered	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
	15	15	15	30	40	100	3 Hrs
Prerequisites							

Course Objective

The objective of this course is to impart preliminary knowledge about the French language and civilization and is therefore of an elementary level. At the end of the one year course, the student is expected to acquire the following skills:

1) Elementary communication skills, based on aural and written comprehension of common words and simple sentences in French.
2) Simple oral and written expression.

Course Outcome

Students will be able to

a) Understand simple words and expressions spoken slowly and distinctly in French and used in day-to-day situations related to the student's immediate environment.
b) Read and understand common words and sentences in French.
c) Say a few words in French in conversations related to simple day-to-day situations.
d) Ask questions for obtaining basic information in everyday situations.
e) Speak in simple sentences in French to describe herself / himself and her / his immediate environment.
f) Write short answers, dialogue, short post card, fill up a questionnaire / form in French.

UNIT I : Grammar I **(7 hours)**

Present tense : -ir, -re verbs
Irregular verbs
Agreement of adjectives
Negation
Interrogation

UNIT II : Grammar II **(7 hours)**

Contracted articles

Partitive articles

Prepositions

Possessive adjectives

UNIT III : Vocabulary **(7 hours)**

Parts of the body
Professions
Seasons
Cardinal and ordinal numbers
Home/town
Meals
Clothes

UNIT IV : Communication skills I **(6 hours)**

Description : person / place /town / house.
Ordering food
Giving information about a person, profession, qualities / thing
Describing a place / home / town
Writing a letter

UNIT V: Communication skills II **(6 hours)**

Conversation on day to day situations.
Inviting, Accepting / refusing
Asking and giving suggestions
Using expressions with `faire'

UNIT VI: Civilisation **(7 hours)**

Some facts about France and French-speaking countries
The cafeteria
Geography of France
Administrative regions of France
French gastronomy
French authors and their works
Important historical personalities

Text book recommended:

	Title	Edition	Author	Publisher
1	Apprenons le frangais', Part 2	2018	Ranjit, Mahita & Singh, Monica	Saraswati House Pvt. Ltd., New Delhi. Second Revised Edition, 2007.
2	'Cahier d'exercices', (Apprenons le francais) 2.	2018	Ranjit, Mahita & Singh, Monica	Saraswati House Pvt. Ltd., New Delhi. Second Revised Edition, 2007.

VIII Semester

GEM161	**Advance Proficiency in French– A1.3**			L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme *Best Two out of three MSE's would be considered	MSE-I*	MSE-II*	MSE-III*	TA	ESE	Total	ESE Duration
	15	15	15	30	40	100	3 Hrs
Prerequisites							

Course Objective

Students should be able to

Learning Advanced Vocabulary
Learning Advanced Grammar Skills
Learn to build Sentences using Advanced Vocabulary and Grammar skills
Learning more useful topics in Dad-to-Day surroundings and life
Writing advanced letters for Enquiries. Practicing Speaking of the same
Advanced Listening exercises.

Course Outcome

Students will be able to

Know about: Filling French Application, Learning Food and Drink items.

Learning Tenses, Using Adjectives in Accusative. Learning more complicated sentences using Tenses, Adjectives, Personal Pronouns in Accusative.

Asking prices of food and drink items in a Supermarket, etc.

Enquiries in a Shopping Market or about Vacation planning. Practicing listening from advanced level tracks and speaking practice.

Write short answers, dialogue, short post card, fill up a questionnaire / form in French and much more.

UNIT I : Grammar I **(7 hours)**

-er -ir, -re and irregular verbs (advance)
Irregular verbs
position of adjectives
adverbs
Reflexive verbs

UNIT II : Grammar II **(7 hours)**

Demonstrative adjective

Preposition (advance)

Interrogation with negation and 'si'

Imperative

Recent past

Near Future

UNIT III : Vocabulary **(7 hours)** School and college Work Time and season Animals Shopping Travelling Misc.
UNIT IV : Communication skills I **(6 hours)** Learning Tenses, Using Adjectives in Accusative. Learning more complicated sentences using Tenses. Asking prices of food and drink items in a Supermarket, etc.
UNIT V: Communication skills II **(6 hours)** Enquiries in a Shopping Market or about Vacation planning. Practicing listening from advanced level tracks and speaking practice. Write short answers, dialogue, short post card, fill up a questionnaire / form in French and much more.
UNIT VI: Civilisation **(7 hours)** Some facts about France and French-speaking countries Geography of France Administrative regions of France French gastronomy French authors and their works Important historical personalities

Text book recommended:

	Title	Edition	Author	Publisher
1	`Apprenons le frangais', Part 3	2018	Ranjit, Mahita & Singh, Monica	Saraswati House Pvt. Ltd., New Delhi. Second Revised Edition, 2007.
2	'Cahier d'exercices', (Apprenons le francais) 3	2018	Ranjit, Mahita & Singh, Monica	Saraswati House Pvt. Ltd., New Delhi. Second Revised Edition, 2007.

YESHWANTRAO CHAVAN COLLEGE OF ENGINEERING
(An Autonomous Institution affiliated to R T M Nagpur University Nagpur)
Accredited by NAAC (1st Cycle) with 'A' Grade (Score 3.25 on 4 Point Scale)
Wanadongri, Hingna Road, Nagpur-441110

Department of General Engineering (Minor in Psychology)

B.E. Minor in Psychology SoE & Syllabus 2022-23

Information Brochure of Minor Program
Scheme of Examinations
Minor in Psychology

SN	Sem	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
					L	T	P	Hrs		MSEs *	TA**	ESE	
B.E. Minor in Psychology													
1	5	GEM171	Concepts of Cognitive Psychology	T	3	0	0	3	3	30	30	40	3
2	5	GEM172	Psychology of Individual Differences	T	3	0	0	3	3	30	30	40	3
3	6	GEM181	Positive Psychology	T	3	0	0	3	3	30	30	40	3
4	6	GEM182	Social Psychology	T	3	0	0	3	3	30	30	40	3
5	7	GEM191	Mental Health	T	3	0	0	3	3	30	30	40	3
6	7	GEM192	Organizational Behaviour	T	3	0	0	3	3	30	30	40	3
			TOTAL		**18**	**0**	**0**	**18**	**18**				

MSEs* = Two MSEs of 15 Marks each will conducted

Semester 5

Credits: 3 (3 Lecture Per Week)

Course Code : GEM171 Course Name: Concepts of Cognitive Psychology

	Course Name: Concepts of Cognitive Psychology		L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	MSE-I*	MSE-II*	TA	ESE	Total	ESE Duration
*Best Two out of three MSE's would be considered	15	15	30	40	100	3 Hrs

Course Objectives	**Course Outcome**
Students should be able to • Explain the concepts of learning and memory. • Study about sensation, perception. • Study about the attention process. • Study the different aspects of thinking.	Upon completion of the course, students will have the ability to, • Understand the laws of learning and apply effective study techniques for memory. • Understand how perceptual organization takes place and how we analyze things around us. • Understand the techniques to improve attention. • Understand thinking process and why errors take place in thinking.

Unit No.	**Contents**	**Max. Hours**
Unit 1	**Introduction to Psychology** • Definition and Nature of Psychology • History and origin of science of psychology • Psychology as art and science • Scope of psychology • Application of psychology • Methods of observation in psychology • Use of psychology for engineering students.	6 hrs

Unit 2	**Learning** • Definition and Nature of Learning • Types of Learning • Laws of Learning • Learning by Trial and Error, Observation, Conditioning. • Learner and Learning • Factors of Effective Learning • Transfer of Learning • Study habits	6 hrs
Unit 3	**Memory and Forgetting** • Definition and Nature • Types of memory • Factors influencing memory • Information Processing Theory of memory • Levels of processing • Forgetting definition • Causes of forgetting • Theories of forgetting • Methods to improve memory	6 hrs
Unit 4	**Sensation and Perception** • Types of sensation • Characteristics of sensation • Alteration in sensations • Relationship between sensation and perception • Laws of perceptual organization • Factors affecting perception • Errors in Perception	6 hrs
Unit 5	**Attention** • Definition • Characteristics of Attention • Types of Attention • Span of Attention • Duration, sustained, shifting of attention • Division of Attention • Determinants of Attention	6 hrs
Unit 6	**Thinking** • Definition and Nature of thinking • Types of thinking • Steps in problem solving • Levels of thinking (Based on Bloom's Taxonomy) • Tools of thinking • Errors in thinking	6 hrs

Reference Books:

1. Baron, R. & Misra. G. (2013). Psychology. Pearson.
2. Chadha, N.K. & Seth, S. (2014). The Psychological Realm: An Introduction. Pinnacle Learning, New Delhi.
3. Ciccarelli, S. K., & Meyer, G. E. (2010). Psychology: South Asian Edition. New Delhi: Pearson Education.
4. Passer, M.W. & Smith, R.E. (2010). Psychology: The science of mind and behaviour. New Delhi: Tata McGraw-Hill

Semester 5

Credits: 3 (3 Lecture Per Week)

Course Code: GEM172 Course Name: Psychology of Individual Differences

	Course Name: Psychology of Individual Differences		L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	MSE-I*	MSE-II*	TA	ESE	Total	ESE Duration
*Best Two out of three MSE's would be considered	15	15	30	40	100	3 Hrs

Course Objective	**Course Outcome**
Students should be able to • Study about body-mind relationship • Study the concepts of personality and its influence on behavior. • Study about intelligence and aptitude. • Study psychology of people during the life cycle.	Upon completion of the course, students will have the ability to, • Comprehend the relationship between mind and body. • Understand personality and individual differences. • Understand intelligence and sub normality. • Understand the change in psychological processes during health and life challenges.

Unit No	**Contents**	**Max.hrs**
Unit 1	Biology of Behavior • Body-mind relationship • Genetics and environment • Brain and behavior • Muscular and glandular controls of behavior.	6 hrs
Unit 2	Personality Concepts • Definition and Characteristics of personality • Dimensions of personality • Factors influencing personality • Theories of personality • Types of personality • Assessment of personality • Clinical features of abnormal personality	8 hrs
Unit 3	Will and Character • Factors of Will	4 hrs

	• Process in development of will • Features of character • Relationship between habits, will and character. • Importance of strong character	
Unit 4	Intelligence • Definition and nature • Classification of intelligence • Characteristics of ideally intelligent person • Emotional Intelligence • Assessment of IQ • Factor theories and Process Theories • Information processing theory • Alteration of Intelligence	6 hrs
Unit 5	Aptitude • Definition and Concept of aptitude • Types of aptitude • Measurement of aptitude	6hrs
Unit 6	Enhancing individual's potential • Motivation - Intrinsic motivation • Self determination theory • Enhancing cognitive potential • Self regulation • Self enhancement • Fostering creativity.	6 hrs

Reference Books:

1. Chadha, N.K. & Seth, S. (2014). The Psychological Realm: An Introduction. Pinnacle Learning, New Delhi.
2. Carr, A. (2011): Positive psychology. Routledge.
3. Ciccarelli, S. K., & Meyer, G. E. (2010). Psychology: South Asian Edition. New Delhi: Pearson Education.
4. Cornelissen, R.M.M., Misra, G. & Varma, S. (2011). Foundations of Indian Psychology, Vol 1. Pearson.
5. Gregory, R.J. (2006). Psychological Testing: History, Principles, and Applications (4th Ed.). New Delhi: Pearson Education.
6. Mentis, M., Dunn-Bernstein, M., Mentis, M., & Skuy, M. (2009). Bridging learning: Unlocking cognitive potential in and out of the classroom. Corwin.
7. Passer, M.W. & Smith, R.E. (2010). Psychology: The science of mind and behaviour. New Delhi: Tata McGraw-Hill.

Semester 6
Credits: 3 (3 Lecture Per Week)
Course Code: GEM181 Course Name: Positive Psychology

	Course Name: Positive Psychology		L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	MSE-I*	MSE-II*	TA	ESE	Total	ESE Duration
*Best Two out of three MSE's would be considered	15	15	30	40	100	3 Hrs

Course Objective	Course Outcome
Students should be able to • Study about the basic concepts and fundamentals of positive psychology. • Study about emotional and subjective well-being. • Study about leisure, flow, savoring, and peak performance. • Study about Excellence, Aesthetics, Creativity and Genius	Upon completion of the course, students will have the ability to, • Understand human strengths and virtues that make life happy. • Understand concepts of positive psychology and importance in happiness. • Understand how peak performance can be enhanced to do well in life. • Understand excellence, aesthetics, creativity and genius.

Unit No.	Contents	Max. hrs
Unit 1	**An Introduction to Positive Psychology** • The Dimensions of Positive Psychology • Scope of positive psychology. • Basic Themes of Positive Psychology • The Good Life • Importance of positive and negative emotions • The science of well-being	6 hrs
Unit 2	**Foundations: Emotion, Motivation, and the** nature of well-being • Basic emotions • Components of emotion • Moods and well-being • Well-being and positive emotions • Definitions of happiness and well-being	6 hrs

Unit 3	**Subjective Well-Being** • The Measurement of Subjective Well-Being • Top down predictors of subjective well-being • Bottom-up predictors of subjective well-being • Increasing happiness and life satisfaction • Hope training • Maintaining happiness	6 hrs
Unit 4	**Leisure, Flow, Mindfulness and Peak Performance** • Leisure • Flow and Optimal Experience • Mindfulness • Savoring • Peak Performance	6 hrs
Unit 5	**Positive Health** • Wellness • Positive health • Psychological Factors Important to Health • Hardiness and Mindfulness Meditation • Positive Aging • Positive Coping • Adjusting to Difficult Life Events	6 hrs
Unit 6	**Excellence, Aesthetics, Creativity and Genius** • The Pursuit of Excellence • Aesthetics and the Good Life • Creativity • Genius • Genius and'madness'	6 hrs

Reference Books

1. Baumgardner, S.R. Crothers M.K. (2010). Positive psychology. Upper Saddle River, N.J.: Prentice Hall.
2. Carr, A. (2004). Positive Psychology: The science of happiness and human strength.UK: Routledge. Peterson, C. (2006). A Primer in Positive Psychology. New York: Oxford University Press.
3. Seligman, M.E.P. (2002). Authentic Happiness: Using the New Positive Psychology to Realize Your Potential for Lasting Fulfillment. New York: Free Press/Simon and Schuster.
4. Snyder, C.R., & Lopez,S.J.(2007). Positive psychology :The scientific and practical explorations of human strengths. Thousand Oaks, CA: Sage.
5. Snyder, C. R., & Lopez, S. (Eds.). (2002). Handbook of positive psychology. New York: Oxford University Press.

Semester 6

Credits: 3 (3 Lecture Per Week)

Course Code: GEM182 Course Name: Social Psychology

	Course Name: Social Psychology		L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	MSE-I*	MSE-II*	TA	ESE	Total	ESE Duration
*Best Two out of three MSE's would be considered	15	15	30	40	100	3 Hrs

Course Objective	**Course Outcome**
Students should be able to • Study social perception and person perception • Study about attitudes and their formation as well as change • Study the phenomenon of how people think about other people • Study prosocial behavior and impression formation	Upon completion of the course, students will have the ability to, • Comprehend and make sense of other people's behavior. • Understand attitudes and their formation and change. • Understand prosocial behaviours • Understand how impressions are formed.

Unit No.	**Content**	**Max. hrs**
Unit 1	**Social and Person Perception** • Social Cognition • Social perception • Mechanism of social perception • Attributions • Impression formation • Person Perception	6 hrs
Unit 2	**Attitude and Stereotype** • ABCs of attitude • Characteristics of attitude • Attitude and beliefs • Stereotype Characteristics • Stereotype and Social life • Stereotype and Prejudice	6 hrs

Unit 3	**Formation of Attitude and Attitude Change** • Factors of Attitude formation • Attitude Change • Persuasive communication • Communicator attractiveness • Characteristics of communicator	6 hrs
Unit 4	**Cooperation, Competition, Conflicts** • Social Interaction and social process • Cooperation • Competition • Conflicts	6 hrs
Unit 5	**Prosocial Behavior** • Prosocial behavior and altruism • Prosocial behavior in emergency situation • Factors affecting helping behavior • Empathy-altruism hypothesis	6 hrs
Unit 6	**Interpersonal Attraction** • Physical attraction • Proximity • Similarity • Interpersonal attraction theory • Rewarding – reduction of stress, anxiety, loneliness • Enhancing self-esteem	6 hrs

Reference Books:

1. Baron, R.A., Byrne, D. & Bhardwaj. G (2010).Social Psychology (12th Ed).New Delhi: Pearson.
2. Chadha, N.K. (2012). Social Psychology. MacMillan: New Delhi
3. Deaux.K & Wrightsman, L. (2001).Social Psychology. California: Cole Publishing
4. Kassin,S., Fein, S., & Markus,H.R. (2008). Social psychology. New York: Houghton Miffin.
5. Misra, G. (2009). Psychology in India, Volume 4: Theoretical and Methodological Developments (ICSSR survey of advances in research). New Delhi: Pearson. Myers, D.G. (2008). Social psychology New Delhi: Tata McGraw-Hill.
6. Taylor,S.E., Peplau,L.A. & Sears,D.O. (2006). Social Psychology (12th Ed). New Delhi: Pearson.

Semester 7
Credits: 3 (3 Lecture Per Week)
Course Code: GEM191 Course Name: Mental Health

	Course Name: Mental Health		L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	MSE-I*	MSE-II*	TA	ESE	Total	ESE Duration
*Best Two out of three MSE's would be considered	15	15	30	40	100	3 Hrs

Course Objective	**Course Outcome**
Students should be able to • Study the concepts of mental health and mental hygiene • Study ego defense mechanisms • Study about frustration, conflict, stress. • Study about motivation and emotion	Upon completion of the course, students will have the ability to, • Comprehend mental health and mental hygiene • Understand the use of ego defense mechanisms. • Understand behavior in terms of frustration, conflict and stress. • Understand about motivation and emotions

Unit No.	• **Content**	**Max. hrs**
Unit 1	Concepts of Mental Health and Mental Hygiene • Define mental health and mental hygiene • Factors influencing mental health • Factors contributing to mental illness. • Characteristics of Mentally Healthy person • Warning signs of poor mental health • Concept of Normality and Abnormality	6 hrs
Unit 2	Ego Defense Mechanism • Types of defensive mechanisms • Adaptive and maladaptive techniques • Examples of defense mechanism • Use of defense mechanism	6 hrs

Unit 3	Guidance and Counseling • Guidance, principles of guidance • Counselling, phases • Principles of counseling • Types of counseling • Areas of counseling • Purpose of guidance and counseling	6 hrs
Unit 4	Frustration, Conflict and Stress • Characteristics of frustration • Sources and reactions to frustration • Conflicts and their types • Resolution to conflict and frustration • Stress – Characteristics • Sources • Body's reaction to stress • Coping techniques	6 hrs
Unit 5	Motivation and Emotion • Needs, drives and motives • Basic human needs • Motivation concepts and theories • Emotions – Concepts • Changes in emotions • Emotional adjustment	6 hrs
Unit 6	Psychological Therapy • Psychotherapy • Stages of psychotherapy • Behavior Therapy • Techniques for modifying behavior	6 hrs

Reference Books

1. Barlow D.H. and Durand V.M. (2005). Abnormal Psychology: An Integrated Approach (4th Ed.).Wadsworth: New York.
2. Bennett,P. (2006). Abnormal and Clinical Psychology: An introductory textbook. New York: Open University Press.
3. Carson, R.C., Butcher,J.N.,Mineka,S.& Hooley,J.M. (2008). Abnormal Psychology. New Delhi: Pearson.
4. Rao, S.N. & Sahajpal, P. (2013) Counselling and Guidance. New Delhi: Tata McGraw Hill.
5. Seligman,L.& Reichenberg ,L.W.(2010). Theories of Counseling and Psychotherapy: Systems, Strategies, and Skills. 3rd Ed. Indian reprint: Pearson.

Semester 7

Credits: 3 (3 Lecture Per Week)

Course Code: GEM192 Course Name: Organizational Behaviour

	Course Name: Organizational Behaviour		L= 3	T = 0	P = 0	Credits = 3
Evaluation Scheme	MSE-I*	MSE-II*	TA	ESE	Total	ESE Duration
*Best Two out of three MSE's would be considered	15	15	30	40	100	3 Hrs

Course Objective	Course Outcome
Students should be able to • Study about fundamental concepts of organizational behavior and job satisfaction • Study about work motivation and its outcome. • Study the theories of work motivation. • Study about organizational commitment.	Upon completion of the course, students will have the ability to, • Comprehend predictors of job satisfaction and its outcome. • Understanding the nature of work motivation and its application. • Understanding the various theories of motivation and their application to the management context. • Comprehend ways of promoting organizational commitment.

Unit No.	Content	Max. hrs
Unit 1	**Organizational Behavior** • Definition of OB • Goals of OB • Characteristics of OB • Organizational Behavior in Indian Context	6 hrs
Unit 2	**Fundamental Concepts in Organizational Behavior** • Nature of people • Nature of Organization • Organizational Paradigm Shift • Organizational Output • Holistic Organizational Behavior	6 hrs

Unit 3	**Job Satisfaction** • Nature of Job Satisfaction • Measurement of JS • Antecedents of JS • Outcomes of JS	6 hrs
Unit 4	**Work Motivation** • Meaning and nature of work • Classification of motives at work • Importance of motivation in Organization	6 hrs
Unit 5	**Theories and Schedules of Reinforcement** • Theories of Motivation • Content Theories • Process Theories • Reinforcement Theory	6 hrs
Unit 6	**Organizational Commitment** • Commitment and Related Aspects • Nature of Organizational Commitment • Antecedents of Organizational Commitment • Outcomes of Organizational Commitment • Building Organizational Commitment	6 hrs

Reference Books:

1. Robbins, S. P. & Judge, T.A. (2007) Organizational Behavior(12th Ed). New Delhi: Prentice Hall of India.
2. Aamodt, M.G. (2oo1): Industrial Organizational Psychology. India: Cengage Learning.
3. Chadha, N. K. (2007): Organizational Behavior. Galgotia; New Delhi.
4. Greenberg, J. and Baron R. A. (2007): Behavior in Organization. (9thEd), India; India; Dorling Kindersley.
5. Luthans, F. (2009): Organizational Behaviour. New Delhi McGraw Hill.
6. Muchinsky, P. (2006): Psychology applied to work: An introduction to industrial and organizational psychology, N C; Hyper graphic