



Government of Maharashtra
GOVERNMENT POLYTECHNIC, NAGPUR
(An Autonomous Institute of Govt. of Maharashtra)

OBE CURRICULUM 2021
DIPLOMA IN COMPUTER ENGINEERING

VISION OF THE INSTITUTE

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To become a Center of Excellence, providing quality technical education and training.

MISSION OF THE INSTITUTE

1. To frame institutional policies for effective implementation of teaching learning process
2. To inculcate values and ethics for life-long learning through curricular, co-curricular and extra-curricular activities
3. To develop facilities and services for academic excellence
4. To enhance the skills of faculties and staff through industry institute collaboration.

VISION OF PROGRAM

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Vision of the Computer Engineering Program:

To provide academic excellence in computer engineering by imparting indepth knowledge that meets the aspirations of the global community and to serve as a valuable resource for industry.

MISSION OF PROGRAM

Mission of the Computer Engineering Program:

- M1.** To develop human potential to its fullest extent so that intellectually capable and optimistic leaders can emerge in a range of profession.
- M2.** To provide quality engineering education to the students through state of art education in Computer engineering
- M3.** To produce globally competent diploma holders having creative skills and ethical values keeping pace with ever-changing technological advancements in Computer Engineering.
- M4.** To establish Industry Institute Interaction to make students ready for the industrial environment.

PROGRAMME EDUCATIONAL OBJECTIVES

The Program Educational Objectives of (PEOs) Computer Engineering Program are:

- PEO1.** To endeavor innovations with a substantial fundamental technical skills.
- PEO2.** To develop an ability to analyze the requirements of the software, understand the technical specifications, design and provide novel engineering solutions and efficient product designs.
- PEO3.** To design system components and processes that meets the quality criteria with appropriate consideration for the cultural, societal, and environmental considerations
- PEO4.** To apply appropriate techniques, resources, and computer engineering tools to various engineering activities with an understanding of the limitations..
- PEO5.** To demonstrate knowledge and understanding of the computer engineering and management principles to manage projects in multidisciplinary environments and to promote student awareness on life-long learning.

PROGRAMME OUTCOMES

- PO1. Basic and Discipline specific knowledge:** Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems.
- PO2. Problem analysis:** Identify and analyze well-defined engineering problems using codified standard methods.
- PO3. Design/ development of solutions:** Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs.
- PO4. Engineering Tools, Experimentation and Testing:** Apply modern engineering tools and appropriate technique to conduct standard tests and measurements.
- PO5. Engineering practices for society, sustainability and environment:** Apply appropriate technology in context of society, sustainability, environment and ethical practices.
- PO6. Project Management:** Use engineering management principles individually, as a team member or a leader to manage projects and effectively communicate about well-defined engineering activities.
- PO7. Life-long learning:** Ability to analyze individual needs and engage in updating in the context of technological changes.

PROGRAM SPECIFIC OUTCOMES (PSOs)

- PSO1:** Design and code engineering problems using programming skills.
- PSO2:** Apply, design and develop principles of software engineering and data base concepts for computer- based systems in solving engineering Problems.



OUTCOME BASED CURRICULUM-

2021

DIPLOMA IN COMPUTER ENGINEERING

The Program Structure and Curriculum Contents for Diploma in Computer Engineering are approved in Advisory Board (AB), Programwise Board of Studies (PBOS), Board of Studies (BOS), And Governing Board (GB), Government Polytechnic, Nagpur.

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		From Industry	Venture and Partner Girnar Motors Nagpur
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15	Dr. M. B. Daigavane	Member Secretary	Principal, G. P. Nagpur

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4	Dr.Sandeep Shirkhedkar	Member Representative From Industry	Director,IMAGIS Engineering Solutions Pvt. Ltd.,Nagpur
5	Mr. Sandeep Darwhekar	Member Representative From Industry	Beta Computronics Pvt. Ltd., 10/1, IT Park, Parsodi, Nagpur 440022
6	Mr.V.G.Thakare	Member Representative From Industry	Director,Simsoft Technologies, Manish Nagar, Nagpur -15
7	Smt.K.S.Mankar	Member Representative M.S.B.T.E.	Deputy Secretary, Regional Board of Technical Education, Nagpur
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			Government Polytechnic, Nagpur
9	Mr.Y.K.Chandarana	Member	Chief Coordinator CDC Cell and Head Applied Mechanics Deptt.
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11	Dr.G.K.Awari	Member	Head of Department Automobile Engineering Government Polytechnic, Nagpur
12	Dr.N.V.Raut	Member	Head of Department Civil Engineering Government Polytechnic, Nagpur
13	Dr.M.V.Sarode	Member	Head of Department Computer Engineering Government Polytechnic, Nagpur
14	Mr.M.N.Gawande	Member Secretary	In Charge, Curriculum Development Cell, Govt. Polytechnic, Nagpur

INSTITUTE LEVEL COMMITTEE FOR CURRICULUM 2021

Sr. No.	Name of Member	Actual Designation	Committee
1	Mr.R.V.Yenkar	Head of Department, Electronics and Telecommunication Department	Chairman
2	Dr.R.G.Choudhari	Head of Department, Mechanical Engineering Department	Member
3	Dr.G.K.Awari	Head of Department, Automobile Engineering Department	Member
4	Dr.V.H.Mankar	Head of Department, Electronics and Tele.Engg.Deptt. (I Shift)	Member
5	Dr.N.V.Raut	Head of Department, Civil Engineering Department (I Shift)	Member
6	Shri.K.L.Meshram	Head of Department, Metallurgical Engineering Department	Member
7	Dr.M.V.Sarode	Head of Deptt, Computer Engg.Depp.	Member
8	Shri.Y.K.Chandarana	Head of Department, Applied Mechanics Department	Chief CDC Coordinator
9	Dr.S.S.Baraskar	Controller of Examination	Member
10	Mr.A.M.Arekar	I/C Head of Department ,	Member

		Electrical Engineering Department	
11	Shri.M.N.Gawande	Lecturer in Electrical Engineering	Member Secretary

PROGRAM-WISE BOARD OF STUDIES

COMPUTER ENGINEERING

S.No.	Name of the Expert	Designation in Board of Studies	Designation/Organisation
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2	Mr. Dipak Dhote	Member Representative From Industry	Operations Manager, IT- Network Infosystems Pvt LTD,Nagpur
3	Dr. Rakesh Kadu	Member Representative Academic Institute	Assistant Professor, I.T., Ramdeobaba College of Engg, and Management, Nagpur.
4	Mrs.V.A.Raje	Member Representative M.S.B.T.E.	System Analyst ,MSBTE,RO Nagpur
5	Mrs.C.R.Chaudhari	Member	Lecturer , Computer Engg.Deptt, Govt.Polytechnic, Nagpur
6	Mrs.D.S.Nalinde	Member	Lecturer , Computer Engg.Deptt, Govt.Polytechnic, Nagpur
7	Mr.M.N.Gawande	Member Secretary	CDC Cell and Lecturer , Electrical Engg.Deptt, Govt.Polytechnic, Nagpur

NATIONAL EDUCATIONAL POLICY-2020

The fundamental principles that will guide both the education system at large, as well as the individual institutions within it are:

1. **recognizing, identifying, and fostering the unique capabilities of each student**, by sensitizing teachers as well as parents to promote each student's holistic development in both academic and non-academic spheres;
2. **according the highest priority to achieving Foundational Literacy and Numeracy** by all students by Grade 3;
3. **flexibility**, so that learners have the ability to choose their learning trajectories and programmes, and thereby choose their own paths in life according to their talents and interests;
4. **no hard separations** between arts and sciences, between curricular and extra-curricular activities, between vocational and academic streams, etc. in order to eliminate harmful hierarchies among, and silos between different areas of learning;
5. **multidisciplinarity and a holistic education** across the sciences, social sciences, arts, humanities, and sports for a multidisciplinary world in order to ensure the unity and integrity of all knowledge;
6. **emphasis on conceptual understanding** rather than rote learning and learning-for-exams;
7. **creativity and critical thinking** to encourage logical decision-making and innovation;
8. **ethics and human & Constitutional values** like empathy, respect for others, cleanliness, courtesy, democratic spirit, spirit of service, respect for public property, scientific temper, liberty, responsibility, pluralism, equality, and justice;
9. **promoting multilingualism and the power of language** in teaching and learning;
10. **life skills** such as communication, cooperation, teamwork, and resilience;
11. **focus on regular formative assessment for learning** rather than the summative assessment that encourages today's 'coaching culture';
12. **extensive use of technology** in teaching and learning, removing language barriers, increasing access for *Divyang* students, and educational planning and management;

13. **respect for diversity** and **respect for the local context** in all curriculum, pedagogy, and policy, always keeping in mind that education is a concurrent subject;
14. **full equity and inclusion** as the cornerstone of all educational decisions to ensure that all students are able to thrive in the education system;
15. **synergy in curriculum across all levels of education** from early childhood care and education to school education to higher education;
16. **teachers and faculty as the heart of the learning process** – their recruitment, continuous professional development, positive working environments and service conditions;
17. a **‘light but tight’ regulatory framework** to ensure **integrity, transparency,** and **resource efficiency** of the educational system through audit and public disclosure while encouraging innovation and out-of-the-box ideas through **autonomy, good governance, and empowerment;**
18. **outstanding research** as a corequisite for outstanding education and development;
19. **continuous review of progress** based on sustained research and regular assessment by educational experts;
20. **a rootedness and pride in India,** and its rich, diverse, ancient and modern culture and knowledge systems and traditions;
21. **education is a public service;** access to quality education must be considered a basic right of every child;
22. **substantial investment in a strong, vibrant public education system** as well as the encouragement and facilitation of true philanthropic private and community participation.

AICTE MODEL CURRICULUM- 2019

GLIMPSES:

AICTE has developed Model Curriculum for diploma programs in 2019 . All the courses in AICTE Model Curriculum are distributed in eight categories.

1) Basic Science Courses 2) Audit Courses 3) Humanities and Social Science Courses 4) Engineering Science Courses 5) Programme Core Courses 6) Programme Elective Courses 7) Open Elective Courses 8) Project Work , Seminar and Internship Courses .

AICTE has made 10-14 weeks summer internships mandatory. Internships are educational and career development opportunities, providing practical experience in a field or discipline. The internship has to be meaningful and mutually beneficial to the intern and organization. To make education holistic; sports, physical activities, values and ethics have been embedded in the curriculum.

Salient features of this model curriculum are enumerated as under:

- Reduced number of credits
- Introduction of Induction Program
- Introduction of Audit Courses on Sports & Yoga in first semester to inculcate the habit of physical and mental fitness right from beginning.
- Well defined learning objectives & outcomes for each course
- Inclusion of courses on socially relevant topics like Environmental Science, Indian Constitution.
- Built-in flexibility to the students in terms of program elective and open elective courses.
- Mandatory internships (Combination of Industrial training and internship in social sector/Govt. organizations/Skill development centres / NGOs/rural developments etc.
- Course on Entrepreneurship and Startups to encourage entrepreneurial skills.
- To the extent possible, the weightage of theory and practical (in terms of contact hours) has been balanced.
- A list of experiments, with the objective clearly spelt out, is specified for each lab course
- Provision of organizing at least one expert lecture per semester for each branch by inviting resource persons from domain specific industry.

MSBTE CURRICULUM HIGHLIGHTS

MSBTE implemented I Scheme Curriculum from academic year 2017-18 .This curriculum is Outcome Based Education Curriculum . Industry Identified Competencies are the focus area of each course curriculum. MSBTE has also included suggested activities for students in curriculum for every course. A students has to submit report of 5-6 pages on student centred activities . MSBTE also suggested to cover some portion of curriculum through open online courses which can accelerate attainment of course outcomes . MSBTE also included self-directed learning of 15-20% of course curriculum . Micro-project is one of the important features . MSBTE has also instructed teacher for creating opportunities and provisions for co-curricular activities . Course for recent trends in the corresponding branch of engineering is included in the curriculum.

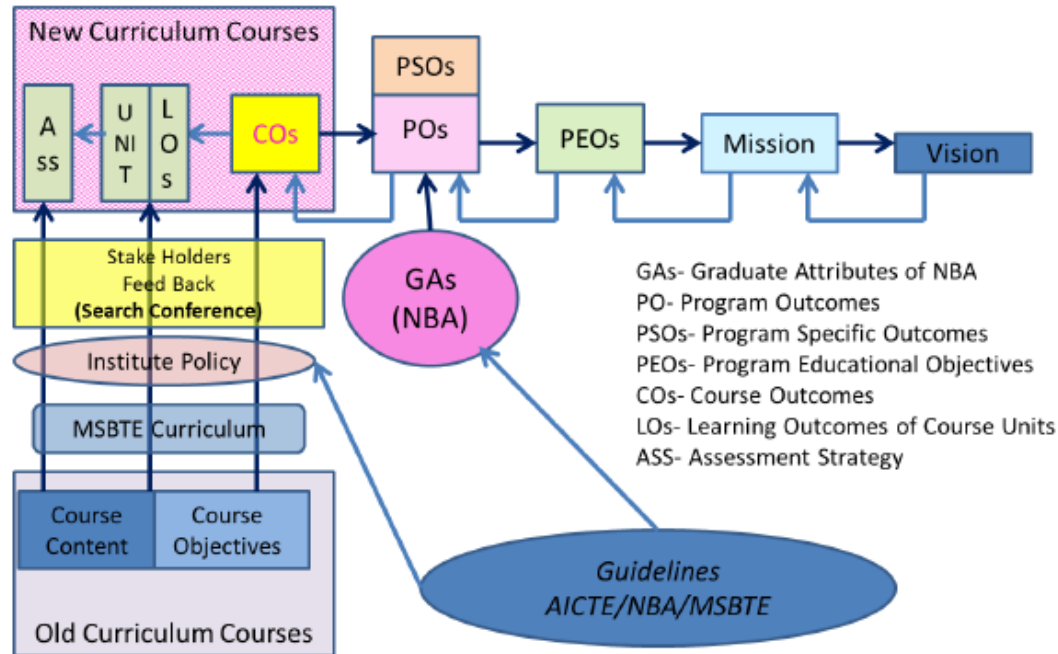
HIGHLIGHTS OF CURRICULUM 2021

- Category wise Distribution of Courses

Sr.No	Category of Courses	No. of Courses in Programme
1	Humanités & Social Sciences Courses	05
2	Basic Science courses	04
3	Engineering Science Courses	07
4	Program Core courses	15
5	Program Elective courses	03
6	Open Elective Courses	01
7	Project , Internship Courses	02
8	Audit Courses	02
	Total	39

- Online courses available on SWAYAM (Study Webs of Active-learning for young aspiring minds), Spoken Tutorial and other equivalent digital platforms are offered to the students in each semester to the extents of 20% credit from total credit of all the courses being offered in the semester, The courses are designed on SWAYAM under the title MOOCS (Massive Open Online Courses) in which student will complete the courses on Online Platform and obtain a certificate and earn credit equivalent to the course available in Curriculum 2021 of the Institute.
- Internship for a complete semester is made compulsory.

CURRICULUM REVISION PROCEDURE



CURRICULUM REVISION PROCESS

Following Method is adopted for Development of Curriculum

- Implementing Outcome Base Education Philosophy
- Study OBE Curricula of Diploma in Engineering in India and Autonomous Institute (MS) .
- Referred I-scheme curriculum of MSBTE, Mumbai.
- Study Model Curriculum of Diploma in Engineering curriculum by AICTE
- Compare 2016 curriculum with MSBTE existing curriculum
- Study NBA/AICTE/MSBTE/NSQF/NHEQF/NEP guidelines
- Organize Search Conference for validation of skills
- Collect Feedback (Program-wise) on existing curriculum from stake holders
- Curriculum mapping with POs to identify curriculum gaps
- Decide Institute Level policies
- Prepare Action Plan for development
- Analyse and Brain storming at program level
- Revise Vision, Mission and PEOs and curriculum at program Level

- Approve from PBOS, BOS and GB.

SEARCH CONFERENCE

The search conference is organized at institute level in the month of Feb 2021. The experts from the industries, academic institutions and alumni were present. The main objectives of organization of search conference are as follows:

- Validate generic and technical skills identified by the program.
- Suggest new skills to be developed in a technician pertaining to specific work area by industry/ field experts.
- Collect Feedback on existing curriculum and suggestions on previous received feedback.
- Suggest new course content to be incorporated in curriculum.
- Obtain suggestions on various topics related to program structure.
- Analyze and prepare a final list of generic skills and technical skills and from courses based on validated skills later on.

FORMATION OF COURSES

All the courses are formed on the basis of skills validates in search conference.

CURRICULUM MAPPING

The earlier curriculum is mapped to identify Program strengths (attributes that are widely addressed) and Gaps (attributes that are addressed by only a few learning experiences).

The simplest form of curriculum map is a matrix whose rows are the learning experiences (curriculum courses) and columns are the Graduate attributes (or Program Outcomes).

To establish the curriculum map, each faculty reviewed his/her courses and identified the attributes that are addressed in the course based on its content and materials.

INSTITUTE LEVEL POLICIES

Institute level policy for curriculum development is decided by the CDC on the basis of followings:

- OBE Model
- Analysis of various curriculum Autonomous Institute/ MSBTE curriculum / OBE curriculum
- NBA/AICTE/MSBTE/NHEQF/NSQF/NEP Guidelines
- Feed Back from stake holders
- Search Conference Outcomes
- Curriculum Mapping with 2016 curriculum.
- Suggestions from PBOS/BOS and GB

SEARCH CONFERENCE –SKILLS VALIDATED FOR COMPUTER ENGINEERING

GENERIC SKILLS FOR COMPUTER ENGINEERING

- G1. Communicate effectively in English in oral and written form with superiors, Subordinates and peers.
- G2. Communicate effectively within and outside the organization
- G3. Exhibit appropriate language skills as demanded by the situation and job at hand.
- G4. Manage oneself and people (seniors, subordinates and colleagues) at work.
- G5. Contribute as a team member in any role to achieve defined goals.
- G6. Create and maintain documentation in various formats as per the requirements of the industry.
- G7. Lead and participate in group discussions and meetings independently and effectively with appropriate contributions.
- G8. Analyze and utilize all available resources like Human, media, market survey, Technical literature etc. to gather information towards the assigned task.
- G9. Prepare and present detailed project proposals, reports, solutions and suggestions for identified products/services and issues at hand.
- G10. To perform in coordination with stakeholders as and when required to provide services managing resources, maintaining relationships and working towards an effective performance.
- G11. Offer an amalgamation of practical and humanitarian approach towards any task at hand.
- G12. Implement learn techniques for increasing concentration and decreasing anxiety.
- G13. Use breathing exercises and healthy fitness activities.

- G14. Use basic skills associated with yoga and physical activities including strength and flexibility, balance and coordination.
- G15. Assess current personal fitness levels.
- G16. Maintain personal fitness through participation in sports and yogic activities.
- G17. Tackle psychological problems associated with the age and lifestyle.
- G18. Behave and work by considering own basic right and basic rights of other persons also.
- G19. Work according to traditions of locality.
- G20. Work in industrial working environment.
- G21. Work in different departments of industry.
- G22. Work in a group to complete given task.
- G23. Deliver seminar on a topic.
- G24. Interact with audience about given topic.
- G25. Use creativity, soft skills in preparing presentation.
- G26. Develop Entrepreneurial spirit and resourcefulness.
- G27. Develop Entrepreneurial quality, competency, and motivation.
- G28. Follow industrial safety practices.
- G29. Creatively think and apply innovative skills in problem solving
- G30. Take Critical and logical decisions.

TECHNICAL SKILLS FOR COMPUTER ENGINEERING DIPLOMA STUDENTS

- T1. Apply the principal and laws of Physics on physically observable things.
- T2. Illustrate broad ideas about different physical phenomena.
- T3. Apply fundamental physics in various Engineering fields.
- T4. Select proper measuring instruments on the basis of range and least count to measure the physical quantities.
- T5. Calibrate different measuring instruments.
- T6. Handle instruments carefully to avoid any type of devastation.
- T7. Sketch the graph.
- T8. Select, handle and operate the equipment and reagents.
- T9. Measure the values/note down the observations.
- T10. Follow systematic procedure or sequence of operations step by step.
- T11. Observe the performance.
- T12. Investigate/test/verify properties or characteristics.
- T13. Handle chemicals and equipment's safely.
- T14. Record readings of experiments.
- T15. Operate Electrical and Electronic Equipment's.
- T16. Locate electrical faults and rectify the same.
- T17. Follow safety precautions while working with electrical equipment's.
- T18. Maintain Electrical and Electronics equipment's
- T19. Identify different types of electronic components.

- T20. Select suitable electronics equipment's
- T21. Identify role and power of administration at different levels.
- T22. Apply different levels of administration
- T23. Identify industrial problems and suggest solution to these problems
- T24. Operate different equipment's used in industries
- T25. Assemble different parts using tools
- T26. Identify requirements of industries.
- T27. Design a suitable model.
- T28. Implement technical knowledge at different levels to obtain solution to a technical problem.
- T29. Carry survey of market & analyze of market prices.
- T30. Prepare technical report.
- T31. Work in a group to complete given task.
- T32. Use all resources like media, market survey, and technical literature.
- T33. Collect information from available resources.
- T34. Prepare a report on a topic and presentation.
- T35. Use all types resource for developing in a start-up
- T36. Identify different processes of entrepreneurship - its contribution and role in the growth and development of individual and the nation.
- T37. Complete each step in the different processes of entrepreneurial venture.
- T38. Manage all hurdles in an entrepreneurial venture.
- T39. Obtain funds from different schemes by government.
- T40. Apply laws of logarithm to solve engineering problems.
- T41. Resolve the given proper fraction into partial fraction for solving the derivatives, integration.
- T42. Arrange the given object in a proper position by using permutation, and select the object from the given object by using combination.
- T43. Use skill, measure the given angle in degree, Radians, and their conversion from degree to radians and vice versa.
- T44. Use concept of allied angle, compound angle, multiple, and sub multiple angle to solve engineering problems.
- T45. Use measures of central tendency and measures of dispersion in decision making.
- T46. Identify the different types of functions, able to solve the example based on functions limits and derivatives.
- T47. Apply concept of extreme in finding maximum profit of production and minimum cost or material needed for production of an article.
- T48. Find the area of plane figure and volume of the solid by using integration.
- T49. Express any no in complex number form and draw the graph of complex no, by using complex no find the angular velocity, magnitude and amplitude of the given function .
- T50. Apply various numerical methods to solve algebraic and simultaneous equations.
- T51. Apply the knowledge of probability to solve problems related to the production process.
- T52. Interpret the basic components and structure of a computer system and its use

- within a networking environment.
- T53. Use core applications including Word, Excel PowerPoint.
 - T54. Write and Prepare formulas, add tables using LATEX and generate Seminar or Projectreports.
 - T55. Analyze digital logic circuits and Perform conversion of different number systems.
 - T56. Building and Understanding the Basic Internet Structure and Processes. Illustrate various forms of organization and its necessity and different aspects of entrepreneurship.
 - T57. Analyze different sources of finance for industry to fulfil capital needs.
 - T58. Interpret principles of human resource management, safety engineering and supervisorymanagement along with various industrial acts.
 - T59. Illustrate various functions of marketing management and inventory control.
 - T60. Calculate various cost of production, selling price of a product and its depreciation.
 - T61. Analyze concept of TQM and modern techniques of quality control.
 - T62. Draw geometrical figures, curves, sketches etc.
 - T63. Construct the views of an object by using principles of orthographic projection.
 - T64. Visualize three dimensional objects and draw isometric projections.
 - T65. Apply various drawing codes, conventions and symbols as per IS SP-46.
 - T66. Interpret various engineering curves.
 - T67. Draw free hand sketches of mechanical elements.
 - T68. Analyze of the working of computers and peripherals.
 - T69. Install computer system including loading software.
 - T70. Apply knowledge about computer system architecture and organization.
 - T71. Ability of writing computer programs in high level languages.
 - T72. Apply knowledge of data structure and programming techniques.
 - T73. Use of databases and knowledge related to database management system.
 - T74. Competency of operating computer systems and popular software packages.
 - T75. Apply knowledge of principles of digital data transmission, communication, methodologies,protocols and networking equipment used in data transmission.
 - T76. Ability of assembling the computers.
 - T77. Competency of testing computer systems.
 - T78. Knowledge and skills of trouble shooting and maintaining computer systems and computerperipherals at card and system level.
 - T79. Competency of using diagnostic test programmes to test hardware and modifying hardware.
 - T80. Establish local area networks.
 - T81. Knowledge of current trends in Computer Engineering.
 - T82. Designing of different website.
 - T83. Analyze the current market scenario for the development of software-market analysis, riskanalysis, requirement gathering.
 - T84. Knowledge of principles of management and entrepreneurship to manage resource optimally, various techniques of economy and quality and Awareness of opportunity available for setting up one's own enterprise and its benefit.

- T85. Design and use application software.
- T86. Awareness about technological advancements and forthcoming areas of development
- T87. Verify the principal and laws.
- T88. Design of digital circuits.
- T89. Analyze various digital circuits like combinational circuits, Sequential circuits.
- T90. Describe operation of basic logic gates
- T91. Analyze the construction and characteristics of semiconductor devices
- T92. Do conversion of number system.
- T93. Describe operation of basic logic gates.
- T94. Develop the logical abilities in students.
- T95. Develop modular programs.
- T96. Analyze Data traffic properties, protocols, queuing.
- T97. Analyze Network topologies, hardware and protocols.
- T98. Access Net from LAN server at different nodes.
- T99. Create PL/SQL block, use exceptions, triggers.
- T100. Use of scripting languages for web page designing.
- T101. Apply knowledge of various security algorithms.
- T102. Configure Android environment and development tools.
- T103. Create Android application using database.
- T104. Configure IPv6 networks.
- T105. Implement different transport layer protocols.
- T106. Choose routing protocol in given situation.
- T107. Create interactive web pages using program flow control structures.
- T108. Create menus and navigations in web pages.
- T109. Create interactive web pages using regular expressions for validations.
- T110. Compare models of Digital Forensics investigation.
- T111. Develop programs by applying various object oriented concepts.
- T112. Perform database operations in PHP.
- T113. Develop python program to demonstrate use of operators.
- T114. Perform operations on data structures using Python.
- T115. Design classes for given problem in Python
- T116. Apply user identification and authentication methods
- T117. Apply measures to prevent attacks on network using firewall.
- T118. Identify different business models for e-governance.
- T119. Apply e-governance life cycle
- T120. Implement the knowledge of e-security and cyber laws.
- T121. Need for innovation and change management in E-governance.
- T122. Develop logical thinking and its application to computer science
- T123. Introduce the student the theory of graphs.
- T124. Develop the habit of thinking mathematically
- T125. Introduce the student the search Engine Optimization
- T126. Categorization of digital marketing for the business

CURRICULUM 2021

CREDIT :-

Definition of Credit: **A unit by which the course work is measured.** It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work/field work per week.

1 Hr. Lecture (L) per Week	1 Credit
1 Hr. Tutorial (T) per Week	1 Credit
1 Hr. Practical (P) per Week	0.5 Credit
2 Hours Practical (P) per Week	1 Credit

Distribution of Credit

Breakup of credit is given below for Diploma In Electrical Engineering.

Sr. No.	Category	Breakup of Credits
1	Humanities & Social Sciences Courses	12
2	Basic Science Courses	16
3	Engineering Science Courses	23
4	Program Core Courses (Branch specific)	55
5	Program Elective Courses (Branch specific)	12
6	Open Elective courses	02
7	Project and Internship Courses	17
8	Audit Courses (Environmental Science, Indian Constitution)	(non-credit)
	Total	137

1. Humanities and Social Science Courses

An integral part of an engineering education involves exposure to the study of the broader contexts within which technology and engineering practice operates. The Social Sciences and Humanities requirements engage engineering students in course work that will provide this broad exposure. These courses provides the student the structured opportunities to understand topics as: human behavior; civil society; geopolitical phenomena; the creative, artistic, linguistic, philosophical, and symbolic cultural endeavors throughout human history; social, economic, and political conflict; and challenges surrounding global health. Because of the importance of good

communication skills to success in all endeavors, each student should seek to enhance these skills by the Social Science and Humanities courses. This category of courses contains English, Life Skills, Business Communication, Industrial Management etc.

By studying humanities and social sciences, a student will have the chance to think and respond to the existing issues that require an innate understanding of the key geographical, historical, economic, political, and societal factors involved. Furthermore an aspiring student will come to know these factors that seem so different from each other actually interrelates.

2. **The Basic Sciences Courses** are defined as the scientific disciplines of Mathematics, Physics, Chemistry. They are called basic sciences because they provide a fundamental understanding of natural phenomena and the processes by which natural resources are transformed. Basic Science Courses must be intended for science or engineering majors; introductory science courses are not acceptable. Basic science courses may be taken concurrently with regular courses. Basic science courses provide the background information so that technical elements can be more completely understood.
3. **Engineering Science Courses** are the courses which impart essential knowledge of area which is common to multidiscipline of engineering. Engineering Science courses create awareness on different specializations of engineering studies. The goal of these courses is to create engineers of tomorrow, who possess the knowledge of all disciplines and can apply their interdisciplinary knowledge in every aspect.
4. **Programme Core Course** means a course that the student admitted to a particular programme must successfully complete to receive the diploma and which cannot be substituted by any other courses. Core courses are designed to maintain, improve, or expand skills and knowledge or to develop new and relevant skills and knowledge.
5. **Programme Elective Course** means a course, which can be chosen from a list of electives and a minimum number of courses is required to complete the programme. These courses can be substituted, by equivalent course from the same subject. These courses and which may be very specific or specialized or advanced or supportive to the discipline.
6. **Open Elective Courses** refer to the courses that students can opt for in addition to their primary area of study. These offer students greater autonomy over their curriculum, giving them the opportunity to customize it to reflect their passions and interests. Open Elective Courses are chosen generally from other discipline/ subject, with an intention to seek interdisciplinary exposure. While choosing the electives,

students shall ensure that they do not opt for the courses with syllabus contents of which are similar to that of their departmental core/elective courses. Student has to choose open elective course from the list of open electives list provided . The students can opt for MOOC courses for open elective under guidance of faculty.

7. **Internship** is a professional learning experience that offers meaningful, practical work related to a student's field of study or career interest. Internship provides practical knowledge to students. Internships are educational and career development opportunities, providing practical experience in a field or discipline. Internship is structured, supervised placements often focused around particular tasks with defined timescales. The internship has to be meaningful and mutually beneficial to the intern and the organization. objectives of internship training:

Internship course

- a. Will expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry.
- b. Provide possible opportunities to learn understand and sharpen the real time technical / managerial skills required at the job.
- c. Exposure to the current technological developments relevant to the subject area of training.
- d. Create conditions conducive to quest for knowledge and its applicability on the job.

Learn to apply the Technical knowledge in real industrial situations.

- a. Expose students to the engineer's responsibilities and ethics.
- b. Familiarize with various materials, processes, products and their applications along with relevant aspects of quality control.
- c. Promote academic, professional and/or personal development.
- d. Expose the students to future employers.
- e. Understand the social, economic and administrative considerations that influence the working environment of industrial organizations
- f. Understand the psychology of the workers and their habits, attitudes and approach to problem solving.

Project Course

The final year project signifies a milestone in an engineering student's life. It helps to bridge the gap between theory-based learning and skills-based learning. The projects fulfill the purpose of synthesizing the knowledge acquired during the years and demonstrating the student's aptitude by applying the knowledge. Every student must do one project in the Final year of their program. The minimum duration of project is 6 months. Students can do their project in Industry or R&D Lab or in house or combination of any two.

8. **Audit Course** means a Course which the student can register without earning Credits (zero Credit Courses). Extra learning is done by students in these courses for understanding social responsibility. The results of audit courses shall not be considered, however students need to complete audit courses for awarding the diploma.

Code

Course code	Definitions
L	Lecture
T	Tutorial
P	Practical
OE	Open Elective

Course level coding scheme:

Three-digit used as suffix with the Course Code for identifying the year of the course e.g.

101, 102 ... for first year

201, 202 ... for second year

301, 302 ... for third year

INTERNSHIP

OBJECTIVES

Internships are educational and career development opportunities, providing practical experience in a field or discipline. They are structured, short-term, supervised placements often focused around particular tasks or projects with defined timescales. An internship may be compensated, non-compensated or some time may be paid. The internship has to be meaningful and mutually beneficial to the intern and the organization. It is important that the Objectives and the activities of the internship program are clearly defined and understood. Following are the intended objectives of internship training:

- Will expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry.
- Provide possible opportunities to learn understand and sharpen the real time technical / managerial skills required at the job.
- Exposure to the current technological developments relevant to the subject area of training.
- Experience gained from the 'Industrial Internship' in classroom will be used in classroom discussions.
- Create conditions conducive to quest for knowledge and its applicability on the job.
- Learn to apply the Technical knowledge in real industrial situations.
- Gain experience in writing Technical reports/projects.
- Expose students to the engineer's responsibilities and ethics.
- Familiarize with various materials, processes, products and their applications along with relevant aspects of quality control.
- Promote academic, professional and/or personal development.
- Expose the students to future employers.
- Understand the social, economic and administrative considerations that influence the working environment
- of industrial organizations
- Understand the psychology of the workers and their habits, attitudes and approach to problem solving.

BENEFITS OF INTERNSHIP:

BENEFITS TO THE INDUSTRY

- Availability of ready to contribute candidates for employment.
- Year round source of highly motivated pre-professionals.
- Students bring new perspectives to problem solving.
- Visibility of the organization is increased on campus.
- Quality candidate's availability for temporary or seasonal positions and projects.
- Freedom for industrial staff to pursue more creative projects.
- Availability of flexible, cost-effective work force not requiring a long-term employer commitment.
- Proven, cost-effective way to recruit and evaluate potential employees.
- Enhancement of employer's image in the community by contributing to the educational enterprise.

BENEFITS TO STUDENTS:

- An opportunity to get hired by the Industry/ organization.
- Practical experience in an organizational setting.
- Excellent opportunity to see how the theoretical aspects learned in classes are integrated into the practical world. On-floor experience provides much more professional experience which is often worth more than classroom teaching.
- Helps them decide if the industry and the profession is the best career option to pursue.
- Opportunity to learn new skills and supplement knowledge.
- Opportunity to practice communication and teamwork skills.
- Opportunity to learn strategies like time management, multi-tasking etc in an industrial setup.
- Opportunity to meet new people and learn networking skills.
- Makes a valuable addition to their resume.
- Enhances their candidacy for higher education.
- Creating network and social circle and developing relationships with industry people.
- Provides opportunity to evaluate the organization before committing to a full time position.

- Benefits to the Institute:
- Build industrial relations.
- Makes the placement process easier.
- Improve institutional credibility & branding.
- Helps in retention of the students.
- Curriculum revision can be made based on feedback from Industry/ students.
- Improvement in teaching learning process.

GOVERNMENT POLYTECHNIC, NAGPUR
DIPLOMA IN COMPUTER ENGINEERING
 TEACHING AND EXAMINATION SCHEME (CURRICULM 2021)
FIRST SEMESTER COMPUTER ENGINEERING

Sr. No.	Course Code	Course Title	Course Category	Teaching Scheme (TH,TU,PR Hrs/Week)*			Credit	Examination Scheme (Max.Marks)				
								Theory Marks		Practical Marks		Total Marks
				TH	TU	PR		TEE	CA	TEE	CA	
1	PH101G	Physics	Basic Science	3	-	2	4	60	40	25@	25	150
2	MH101G	Basic Mathematics	Basic Science	3	1		4	60	40	-	-	100
3	EN101G	English	Humanities and Social Science	2	-	2	3	30	20	25@	25	100
4	EE101G	Basics of Electrical Engineering	Engineering Science	3	-	2	4	60	40	25@	25	150
5	CM151G	Computer Workshop	Engineering Science	-	-	4	2	-	-	25@	25	50
6	ME151G	Engineering Graphics	Engineering Science	-	-	4	2	-	-	25@	25	50
7	LS151G	Life Skills	Humanities and Social Science	-	-	2	1	-	-	-	25	25
8	IC151G	Indian Constitution	Audit	1	-	-	-	-	-	-	-	Grades
			Total	12	1	16	20	210	140	125	150	625

Abbreviations:

• TH – Theory ; PR- Practical; TU- Tutorial; TEE- Term End Examination; CA-Continuous Assessment

*Credit Formula: 1 TH Hr. = 1 Credit; 1 TU Hr. = 1 Credit; 2 PR Hrs. = 1 Credit

Symbolic Representation

** Online Examination, @ Internal Practical Examination, # External Practical Examination, \$ Award of class course.

Student Centered Activity – Library -1 Hour, Sports- 2 Hours,

Student Creative Activity-2 Hours Self Learning Mode Through MOOCS/NPTEL/ SWAYAM

Audit courses are to be evaluated with Grades(A, B, C)

GOVERNMENT POLYTECHNIC, NAGPUR
DIPLOMA IN COMPUTER ENGINEERING
 TEACHING AND EXAMINATION SCHEME (CURRICULM 2021)
SECOND SEMESTER COMPUTER ENGINEERING

Sr. No.	Course Code	Course Title	Course Category	Teaching Scheme (TH,TU,PR Hrs/Week)*			Credit	Examination Scheme (Max.Marks)				
								Theory Marks		Practical Marks		Total Marks
				TH	TU	PR		TEE	CA	TEE	CA	
1	MH102G	Applied Mathematics	Basic Science	3	1	-	4	60	40	-	-	100
2	CH101G	Chemistry	Basic Science	3	-	2	4	60	40	25@	25	150
3	EC104G	Principles of Electronics	Engineering Science	3	-	2	4	60	40	25@	25	150
4	IT101G	Basics of Programming	Engineering Science	3	-	4	5	60	40	25@	25	150
5	IT151G**	Introduction to IT Systems (Online Course)	Engineering Science	-	-	-	2	-	-	25@	25	50
6	EN151G	Business Communication	Humanities and Social Science	1	-	2	2	-	-	25@	25	50
7	EV151G	Environmental Science	Audit	2	-	-	-	-	-	-	-	Grades
			Total	15	1	10	21	240	160	125	125	650

Abbreviations:

• TH – Theory ; PR- Practical; TU- Tutorial; TEE- Term End Examination; CA-Continuous Assessment

*Credit Formula: 1 TH Hr. = 1 Credit; 1 TU Hr. = 1 Credit; 2 PR Hrs. = 1 Credit

Symbolic Representation

** Online Examination, @ Internal Practical Examination, # External Practical Examination, \$ Award of class course.

Student Centered Activity - Library -1 Hour, Sports- 2 Hours,

Student Creative Activity-2 Hours Self Learning Mode Through MOOCS/NPTEL/ SWAYAM

Audit courses are to be evaluated with Grades(A, B, C)

GOVERNMENT POLYTECHNIC, NAGPUR
DIPLOMA IN COMPUTER ENGINEERING
 TEACHING AND EXAMINATION SCHEME (CURRICULM 2021)
THIRD SEMESTER COMPUTER ENGINEERING

Sr. No.	Course Code	Course Title	Course Category	Teaching Scheme (TH,TU,PR Hrs/Week)*			Credit	Examination Scheme (Max.Marks)				
								Theory Marks		Practical Marks		Total Marks
				TH	TU	PR		TEE	CA	TEE	CA	
1	CM201G	Discrete Structures and Graph Theory	Core Course	3	-	-	3	60	40	-	-	100
2	CM202G ^{\$}	Data Structures ^{\$}	Core Course	3	1	2	5	60	40	50#	25	175
3	CM203G ^{\$}	Python Programming ^{\$}	Core Course	3	-	2	4	60	40	50#	25	175
4	CM204G ^{\$}	Database Management System ^{\$}	Core Course	3	-	2	4	60	40	50#	50	200
5	CM205G ^{**}	Computer Communication and Network ^{**}	Core Course	3	-	2	4	60 ^{**}	40	50#	25	175
6	EC215G	Digital Techniques	Engineering Science	3	-	2	4	60	40	25@	25	150
7	IT251G	Web Page Design	Core Course	-	-	4	2	-	-	50#	25	75
			Total	18	1	14	26	360	240	275	175	1050

Abbreviations:

• TH – Theory ; PR- Practical; TU- Tutorial; TEE- Term End Examination; CA-Continuous Assessment

*Credit Formula: 1 TH Hr. = 1 Credit; 1 TU Hr. = 1 Credit; 2 PR Hrs. = 1 Credit

Symbolic Representation

** Online Examination, @ Internal Practical Examination, # External Practical Examination, \$ Award of class course.

Student Centered Activity - Library -1 Hour, Sports- 2 Hours,

Student Creative Activity-2 Hours Self Learning Mode Through MOOCS/NPTEL/ SWAYAM

GOVERNMENT POLYTECHNIC, NAGPUR
DIPLOMA IN COMPUTER ENGINEERING
 TEACHING AND EXAMINATION SCHEME (CURRICULM 2021)
FOURTH SEMESTER COMPUTER ENGINEERING

Sr. No.	Course Code	Course Title	Course Category	Teaching Scheme (TH,TU,PR Hrs/Week)*			Credit	Examination Scheme (Max.Marks)				
								Theory Marks		Practical Marks		Total Marks
				TH	TU	PR		TEE	CA	TEE	CA	
1	CM206G	Information & Cyber Security	Core Course	3	-	-	3	60	40	-	-	100
2	CM207G ^{\$}	Java Programming ^{\$}	Core Course	3	-	2	4	60	40	50#	25	175
3	CM208G	Microprocessor	Core Course	3	-	2	4	60	40	50@	25	175
4	IT206G ^{\$}	Software Engineering ^{\$}	Core Course	3	-	2	4	60	40	50#	25	175
Elective -I (Any One)												
5	CM209G ^{\$}	Advanced Computer Network ^{\$}	Programme Elective	3	-	2	4	60	40	50#	25	175
	CM210G ^{\$}	Data Warehouse and Mining ^{\$}										
6	CM211G	Digital Marketing	Core Course	3	-	2	4	60	40	50#	25	175
7	CM251G	Web Programming using PHP	Core Course	-	-	4	2	-	-	50#	25	75
8	AE213G**	Industrial Management	Humanities and Social Science	3	-	-	3	60**	40	-	-	100
			Total	21	0	14	28	420	280	300	150	1150

Abbreviations:

• TH – Theory ; PR- Practical; TU- Tutorial; TEE- Term End Examination; CA-Continuous Assessment

*Credit Formula: 1 TH Hr. = 1 Credit; 1 TU Hr. = 1 Credit; 2 PR Hrs. = 1 Credit

Symbolic Representation

** Online Examination, @ Internal Practical Examination, # External Practical Examination, \$ Award of class course

GOVERNMENT POLYTECHNIC, NAGPUR
DIPLOMA IN COMPUTER ENGINEERING
 TEACHING AND EXAMINATION SCHEME (CURRICULM 2021)
FIFTH SEMESTER COMPUTER ENGINEERING

Sr. No.	Course Code	Course Title	Course Category	Teaching Scheme (TH,TU,PR Hrs/Week)*			Credit	Examination Scheme (Max.Marks)				
				TH	TU	PR		Theory Marks		Practical Marks		Total Marks
								TEE	CA	TEE	CA	
1	CM301G ^{\$}	Operating System ^{\$}	Core Course	3	-	2	4	60	40	50#	25	175
2	CM302G ^{\$}	Advance Java ^{\$}	Core Course	3	-	2	4	60	40	50#	25	175
3	IT305G	Software Testing	Core Course	3	-	2	4	60	40	50#	25	175
Elective-II (Any one)												
4	CM303G ^{\$}	Machine Learning ^{\$}	Programme Elective	3	-	2	4	60	40	50#	25	175
	CM304G ^{\$}	Internet Of Things ^{\$}										
Elective-III (Any one)												
5	CM305G	Mobile Application Development	Programme Elective	3	-	2	4	60	40	50#	25	175
	CM306G	Cloud Computing										
6	ES351G	Entrepreneurship and Start up	Humanities and Social Science	2	-	2	3	-	-	-	25	25
7	OE201G TO OE222G**	Open Elective	Open Elective	2	-	-	2	30**	20	-	-	50
8	CM351G ^{\$}	Project ^{\$}	Project and Internship	-	-	4	2	-	-	100#	100	200
			Total	19	0	16	27	330	220	350	250	1150

Abbreviations:

• TH – Theory ; PR- Practical; TU- Tutorial; TEE- Term End Examination; CA-Continuous Assessment

*Credit Formula: 1 TH Hr. = 1 Credit; 1 TU Hr. = 1 Credit; 2 PR Hrs. = 1 Credit

Symbolic Representation

** Online Examination, @ Internal Practical Examination, # External Practical Examination, \$ Award of class course.

GOVERNMENT POLYTECHNIC, NAGPUR
DIPLOMA IN COMPUTER ENGINEERING
 TEACHING AND EXAMINATION SCHEME (CURRICULM 2021)
SIXTH SEMESTER COMPUTER ENGINEERING

Sr. No.	Course Code	Course Title	Course Category	Teaching Scheme (TH,TU,PR Hrs /Week)*			Credit	Examination Scheme (Max.Marks)				
								Theory Marks		Practical Marks		Total Marks
				TH	TU	PR		TEE	CA	TEE	CA	
1	IN351G ^{\$}	Internship ^{\$}	Project and Internship	-	-	30	15	-	-	100#	100	200
			Total	-	-	30	15	-	-	100	100	200

Abbreviations:

• TH – Theory ; PR- Practical; TU- Tutorial; TEE- Term End Examination; CA-Continuous Assessment

*Credit Formula: 1 TH Hr. = 1 Credit; 1 TU Hr. = 1 Credit; 2 PR Hrs. = 1 Credit

Symbolic Representation

** Online Examination, @ Internal Practical Examination, # External Practical Examination, \$ Award of class course.

Teaching load =6 x 3 =18

AWARD OF CLASS

Sr. No.	Course Code	Course Title	Course Category	Teaching Scheme (TH,TU,PR Hrs/Week)*			Credit	Examination Scheme (Max.Marks)				
								Theory Marks		Practical Marks		Total Marks
				TH	TU	PR		TEE	CA	TEE	CA	
1	CM202G	Data Structures \$	Core Course	3	1	2	5	60	40	50#	25	175
2	CM203G	Object Oriented programming using Python \$	Core Course	3	-	2	4	60	40	50#	25	175
3	CM204G	Database Management System\$	Core Course	3	-	2	4	60	40	50#	50	200
4	CM207G	Java Programming\$	Core Course	3	-	2	4	60	40	50#	25	175
5	IT304G	Software Engineering\$	Core Course	3	-	2	4	60	40	50#	25	175
6	CM209G	Advanced Computer Network\$	Programme Elective	3	-	2	4	60	40	50#	25	175
	CM210G	Data Warehouse and Mining\$										
7	CM301G	Operating System\$	Core Course	3	-	2	4	60	40	50#	25	175
8	CM302G	Advance Java \$	Core Course	3	-	2	4	60	40	50#	25	175
9	CM303G	Machine Learning\$	Programme Elective	3	-	2	4	60	40	50#	25	175
	CM304G	Internet of things\$										
10	IN351G	Internship\$	Project and Internship	-	-	30	15	-	-	100#	100	200
11	CM351G	Project\$	Project and Internship	-	-	4	2	-	-	100#	100	200
			Total	27	1	52	54	540	360	650	450	2000

Abbreviations:

• TH – Theory ; PR- Practical; TU- Tutorial; TEE- Term End Examination; CA-Continuous Assessment

*Credit Formula: 1 TH Hr. = 1 Credit; 1 TU Hr. = 1 Credit; 2 PR Hrs. = 1 Credit

Symbolic Representation \$ Award of class course.

LIST OF OPEN ELECTIVE

Sr. No	Course Code	Course Title	Course Category	Teaching Scheme (TH,TU,PR Hrs/Week)*			Credit	Examination Scheme (Max.Marks)				
								Theory Marks		Practical Marks		Total Marks
				TH	TU	PR		TEE	CA	TEE	CA	
01	OE201G	Industry 4.0**	Open Elective	2			2	30	20			50
02	OE203G	Introduction to E-Governance**	Open Elective	2			2	30	20			50
03	OE204G	Cyber Securities and Laws**	Open Elective	2			2	30	20			50
04	OE206G	Energy Waste Management**	Open Elective	2			2	30	20			50
05	OE207G	Total Quality Management**	Open Elective	2			2	30	20			50
06	OE208G	Additive Manufacturing & 3D Printing**	Open Elective	2			2	30	20			50
07	OE210G	Renewable Energy Sources for Mobility**	Open Elective	2			2	30	20			50
08	OE211G	Selection of Materials**	Open Elective	2			2	30	20			50
09	OE212G	Non Destructive Testing**	Open Elective	2			2	30	20			50
10	OE215G	Renewable Energy Technologies**	Open Elective	2			2	30	20			50
11	OE216G	Energy Conservation Opportunities**	Open Elective	2			2	30	20			50
12	OE217G	Electric Vehicle**	Open Elective	2			2	30	20			50
13	OE218G	Artificial Intelligence**	Open Elective	2			2	30	20			50
14	OE220G	Green Building**	Open Elective	2			2	30	20			50
15	OE221G	Building Services**	Open Elective	2			2	30	20			50
16	OE222G	Mechatronics**	Open Elective	2			2	30	20			50
17	OE223G	Technological Evolution In Computer**	Open Elective	2			2	30	20			50
18	OE224G	MOOC**	Open Elective	2			2	30	20			50

ABSTRACT OF CURRICULLUM TEACHING AND EXAMINATION SCHEME

Sr. No.	Semester	Teaching Scheme (TH,TU,PR Hrs/Week) Total			Credit Total	Examination Scheme (Total Max.Marks)				
						Theory Marks		Practical Marks		Total Marks
		TH	TU	PR		TEE	CA	TEE	CA	
1	I	12	1	16	20	210	140	125	150	625
2	II	15	1	10	21	240	160	125	125	650
3	III	18	1	14	26	360	240	275	175	1050
4	IV	21		14	28	420	280	300	150	1150
5	V	19	0	16	27	330	220	350	250	1150
6	VI	0	0	30	15	0	0	100	100	200
	Total	85	3	100	137	1560	1040	1275	950	4825

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : DIPLOMA IN CE ,ME, EE,EC, MC,IT, CM, MT,PK, AE,TX,AI

COURSE CATEGORY: BASIC SCIENCE COURSE

COURSE CODE : PH101G

COURSE TITLE : PHYSICS

TEACHING SCHEME: TH:03; TU: 00;PR: 02(CLOCK HRs.)

TOTAL CREDITS : 04(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)

TH. TEE EXAM : 03 HRs

PR. TEE EXAM : 02 HRs

PT. EXAM : 01 HR

❖ RATIONALE:

Physics is a fundamental science that endeavors to explain all the natural phenomena that occur in the universe. Studying physics will enable students to become citizens who are better informed about the world around them and who have the critical skills to evaluate and make evidence-based decisions about current scientific issues. The subject will also provide a foundation in physics knowledge, understanding and skills for those students who wish to pursue tertiary study in engineering and technology.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Determine various physical quantities of matter using various measuring instrument.
2. Apply the laws and principles of electricity and magnetism to solve engineering problems.
3. Use the basic principles of heat and optics for engineering applications

4. Apply principles of wave motion, acoustics and radioactivity for engineering problems.
5. Apply the basic physical concepts and terminology used in modern physics.
6. Identify nanotechnology and non-destructive testing for various applications in engineering.

❖ **COURSE DETAILS:**

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs .
1. General Properties of Matter	1a. Describe the given types of modules of elasticity. 1b. Identify least count and range of given instruments. 1c. Illustrate the phenomenon of Capillarity and angle of contact of for given liquid . 1d. Find given physical quantities using laws of viscosity .	1.1 Elasticity, Plasticity, Rigidity. Stress and Strain with their types, Elastic Limit, Hook's Law, Types of modulus of Elasticity, Stress-Strain curve, Applications of elasticity, calculation of the value of Young's modulus of elasticity of given wire . 1.2 Least count and range of instruments: Vernier caliper, outside micrometer screw gauge, travelling microscope. 1.3 Surface Tension, Factors affecting surface tension, Molecular force, cohesive and adhesive force, Angle of contact with its significance and capillary action (formula only), Application, determination of rise of liquid in capillary tube and surface tension of liquid. 1.4 Viscous force, Definition of viscosity, Newton's law of viscosity, Stoke's law, statement and formula only, Coefficient of viscosity and S.I. unit. Types of flow of liquid, Application, calculation of Reynold's number, terminal velocity and coefficient of viscosity of given fluids.	06
2. Electricity, Magnetism and	2a. Apply Coulomb's inverse square law for determining the force between different	2.1 Concept of charge, Coulomb's inverse square law, Electric field, Electric field intensity, potential and potential difference.	08

Semiconductors	charges on given data. 2b. Describe given concepts of magnetism. 2c. Determine given parameters in electricity using Ohm's law. 2d. Differentiate materials on the basis of given energy band diagram. 2e. Describe the given biasing and its characteristics of PN junction diode.	2.2 Magnetic field and magnetic field intensity and its units, magnetic lines of force, magnetic flux. 2.3 Electric current, Ohm's law, specific resistance, laws of series and parallel combination of resistance, heating effecting of electric current, calculation of resultant resistance of given resistances in series and parallel combination. 2.4 Conductors, Insulators and Semiconductors, Energy bands, intrinsic and extrinsic semiconductors. 2.5 p-n junction diode, I-V characteristics of p-n junction, applications of p-n junction diode.	
3. Heat and Fiber Optics	3a. Select the modes of transmission of heat for given materials. 3b. Illustrate the given laws related to gas and specific heat. 3c. Describe the given phenomenon of light.	3.1 Heat: Three modes of transmission of heat. Good and bad conductor of heat with examples, Law of thermal conductivity and S.I. units. 3.2 Boyles' law, Charles' law, Gay Lussac's law, absolute zero temperature, General gas equation (statement only), two specific heats of gases, adiabatic index. 3.3 Reflection, Refraction, Snell's law, Optical fiber, Structure of optical fiber. Principle of Optical fiber-total internal reflection. Acceptance angle, Numerical aperture. Applications of Optical Fiber.	10
4. Wave Motion and Radioactivity	4a. Classify the given types of wave by their characteristics. 4b. Calculate velocity of sound with end correction on given data. 4c. Find given terms related to Acoustics. 4d. Calculate half-life period of given radioactive substance.	4.1 Definition of wave motion, amplitude, period, frequency & wavelength, relation between velocity, frequency & wavelength. Progressive wave, Stationary waves, longitudinal and transverse wave. Node, Antinode. 4.2 Definition of resonance with example. Formula for velocity of sound with end correction, calculation of velocity of sound with the help of resonance tube. 4.3 Echo, Reverberation, Reverberation Time. Absorption coefficient of	08

		material, Sabine's formula, Factors affecting the Reverberation of time and acoustics of building. Sound absorbing materials, calculation of reverberation time by Sabin's formula. 4.4 Radioactivity, α, β and γ rays and their Properties. Radioactive decay law, half- life period, Advantages and disadvantages of Radioactivity.	
5. Modern Physics (Photoelectricity, LASER, X-Rays)	5a. Calculate given parameters of the photo electricity using given wavelength or frequency. 5b. Apply the basic concepts of LASER in given fields. 5c. Describe the production of X-rays of the given materials with properties and applications.	5.1 Photon, properties of photons, Planck's hypothesis, Threshold frequency, threshold wavelength and Stopping potential. Work function, Photoelectric effect with characteristics properties. Principle, Construction and working of Photoelectric cell with applications. Einstein's photoelectric equation. (Numerical based on above) 5.2 Properties of laser, Types of laser, absorption, spontaneous and stimulated emission. Definition of Pumping and its type, Population inversion, Metastable state. Applications of LASER in Engineering and biomedical field. 5.3 Introduction to X-rays, Properties of X-rays, production of X-ray using Coolidge tube. Applications of X-rays in Engineering, medical and scientific field.	12
6. Nanotechnology and Non Destructive Testing.	6a. Calculate surface area per volume ratio of given objects. 6b. Compare DT and NDT methods on the basis of given points.	6.1 Definition of nanoscale, nanometer, nanoparticle, determination of surface area per volume ratio of objects, application of nanotechnology in Engineering and Technology, medical, cosmetics, environmental, space and defence. 6.2 Non Destructive Testing (NDT), comparison of DT and NDT, Various NDT methods used, Criteria for the selection of NDT method, Merits and Demerits of	04

		NDT.	
		Total Hrs.	48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practical	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Identify the various instruments used in Physics laboratory and follow precautionary measures.	General Properties of Matter	02
2	Measure the outer diameter of a cylindrical body by Vernier Caliper.		02
3	Calculate the diameter of a small spherical body by Outside micrometer screw gauge.		02
4	Calculate the value of Young's modulus of elasticity of given wire .		02
5	Find rise of liquid in capillary tube and compute surface tension of liquid.		02
6	Determine the coefficient of viscosity of given fluids by Stoke's method		02
7	Calculate mechanical equivalent of heat, J by electrical method.	Electricity, Magnetism and Semiconductor	02
8	Use magnetic compass to draw the magnetic lines of forces of bar magnet		02
9	Calculate the resultant resistance of given resistances in series and parallel combination.		04
10	Analyze the effect of volume on pressure at constant temperature.	Heat, Gas Laws and Fibre Optics	02
11	Determine inner diameter of resonance tube using Vernier Caliper.	Wave Motion and Radioactivity	02
12	Find the velocity of sound with the help of resonance tube.		04
13	Find the divergence of Laser beam.	Modern Physics	02
14	Calculate the surface area (SA), volume (V) and SA/V of an object and measure dimensions required for it.	Nanotechnology and Non Destructive Testing	02
		Total hours	32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	General Properties of Matter	02(04)	06(00)	00(00)	08(04)
2	Electricity, Magnetism and Semiconductor	02(00)	06(06)	03(00)	11(06)
3	Heat, Gas Laws and Fiber Optics	02(00)	06(00)	03(06)	11(06)
4	Wave Motion and Radioactivity	02(02)	03(06)	06(00)	11(08)
5	Modern Physics	02(00)	06(03)	06(06)	14(09)
6	Nanotechnology and Non Destructive Testing	02(00)	03(03)	00(00)	05(03)
	Total	12(06)	30(18)	18(12)	60(36)

U – Understand

A – Analyze / Apply

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:**

L- Level of Question

M- Marks

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

[illegible]

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Who m	Frequency	Max Mark s	Min Mark s	Evidence Collected	Course Outcome s
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignment s		Assignment s	15	--	Assignmen t Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	60	24	Theory Answer Scripts	1,2,3,4,5, 6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assignment s	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End of the Course	25	10	Practical Answer Scripts	1,2,3,4,5, 6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form		1, 2, 3, 4,5,6	
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Drawing circuit diagram, selection of equipment. writing procedure etc.	10
2	Performance	20
3	Calculation, Result, Drawing Graphs(if any)	10
4	Viva Voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	1	2	3
1	3	-	-	3	-	-	3	-	-	-
2	3	-	-	-	2	-	3	-	-	-
3	3	-	-	-	-	-	3	-	-	-
4	3	-	-	3	-	-	3	-	-	-
5	3	-	-	-	2	-	3	-	-	-
6	3	-	-	3	-	-	3	-	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Modern Physics	B.L.Thereja, S.Chand & Company Ltd 5 th Edition, 2014	13:978-8-12-190163-5
2	Engineering Physics	V.Rajendran, The McGraw Hill Education Pvt. Ltd, 1 st Edition, 2010	13: 978-0-07-107014-0
3	Conceptual Physics	P.G.Hewitt, San Francisco Addison Wesley- 10 th Edition, 2006	13: 9780321909107
4	Engineering Physics	R.K.Gaur and S.L.Gupta, Dhanpatrai Publication New Delhi, 1987	97-8-18-992822-3

❖ **E-REFERENCES:**

- <https://www.britannica.com/science/viscosity>, accessed on 21 June 2021.
- <https://www.livescience.com/58816-photoelectric-effect.html>, accessed on 19 June 2021.

- <https://www.livescience.com/58816-photoelectric-effect.html>, accessed on 19 June 2021.
- <https://www2.lbl.gov/abc/wallchart/chapters/03/4.html>, accessed on 19 June 2021.

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

1. Vernier Caliper (Least count= 0.01 cm and range= 0 to 12 cm)
2. Screw gauge (Least count= 0.001 cm and range= 0 to 2.5 cm)
3. Young's Modulus- Searle's apparatus with micrometer reading 0.001 cm.
4. Travelling microscope (vertical and horizontal scales with range 0- 15 cm with least count 0.001 cm)
5. Resonance apparatus with glass tube and metal reservoir (L= 0- 100 cm)
6. Tuning fork -256, 320, 384, 428, 480, 512 Hz.
7. Boyle's apparatus iron base double steel rod, 25 ml fitted with leveling screw on base
8. Stoke's apparatus with glass tube 50 cm.
9. Stop watch GEM 1/10 sec.
10. Ammeter (DC, 0-5 Amp)
11. Millimeter (DC, 0-1 Amp. G.E. type D 50)
12. Voltmeter (DC, 0-3V)
13. Rheostat single tube of 6.5 cm dia., 30 cm length, 5 Amp, 18 ohm, provided with Bakelite solidier with phosphor, bronze contacts.
14. Joule's calorimeter with mass 198 cal/gms.

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr.S.B.Raut	Lecturer	Government Polytechnic, Nagpur.
2	Mrs.S.B.Adulkar	Lecturer	Government Polytechnic, Nagpur.
3	Dr.A.R.Karule	Lecturer	Government Polytechnic, Nagpur.
4	Dr.N.V.Pradnyakar	Associate Professor	J D College of Engineering and Technology, Nagpur
5	Dr.V.B.Pawade	Assistant Professor	Laxminarayan Institute of Technology, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : DIPLOMA IN CE/ME/AE/PK/MT/EE/EC/IT/CM/TX/
MC/AI

COURSE CATEGORY: BASIC SCIENCE COURSE

COURSE CODE : MH101G

COURSE TITLE : BASIC MATHEMATICS

TEACHING SCHEME: TH:03; TU: 01(1TH/TU CREDIT=1CLOCK HRS.)

TOTAL CREDITS : 04

TH. TEE : 03 HRs

PR. TEE : --

PT. : 01 HR

❖ RATIONALE:

The course is classified under basic sciences and intends to teach students basic facts, concepts and principles of Mathematics as a tool to analyze Engineering problems. Mathematics lay- down the foundation for understanding core Technology courses.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Apply laws of logarithm to solve engineering problems.
2. Resolve Proper real fractions into partial fractions.
3. Apply matrix method to solve simultaneous equations in two and three variables.
4. Use concept of allied angle, compound angle, multiple, and sub multiple angle to solve engineering problems.
5. Find principle value of inverse trigonometric functions, use properties to solve the examples of inverse trigonometric functions.
6. Use measures of central tendency and measures of dispersion in decision making.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. Logarithm	1a. Evaluate the value of given logarithm without using calculator. 1b. Solve the given logarithm by using Laws of logarithm. 1c. Identify natural and common logarithm.	1.1 Logarithm:-Concept of Logarithm 1.2 Rules and Laws of Logarithm; Addition, Subtraction, Multiplication, Division and Change of Base Formula. 1.3 Concept of natural & common logarithm	03
2. Partial Fractions	2a. Identify rational function, proper and improper fraction. 2b. Resolve the given proper fraction into partial fraction. 2c. Resolve the given improper fraction into partial fraction.	2.1 Concept of rational function , proper ,improper fraction and partial fraction 2.2 Resolving proper fraction into partial fraction. Denominator containing non repeated linear factors, Denominator containing repeated linear factors, Denominator containing irreducible non repeated quadratic factors 2.3 Resolving improper fraction into partial fraction.	05
3. Determinant and Matrix	3a. Find the value of given determinant of order 2 and 3. 3b. Solve the given matrix by using Algebra of matrix, transpose of matrix , ad-joint of matrix, singularity of matrix and find inverse of matrix. 3c. Solve the given simultaneous equation in two and three variables.	3.1 Concept of determinant ,order of determinant, Expansion & Evaluation of determinant of order 2 and 3 3.2 Concept of matrix, Types of matrices, Algebra of matrices Transpose of matrix , ad-joint, singularity of matrix and inverse of matrix 3.3 Solution of system of linear equations two and three variables by inverse matrix method	12
4. Trigonometry	4a. Use fundamental identities to solve the given Trigonometric relation. 4b. Apply the concept of allied angle , compound angle, multiple angle (2θ and 3θ) sub-multiple angle ($\frac{\theta}{2}$), to solve the given trigonometric relation. 4c. Apply Factorisation, De-	4.1 Fundamental identities, Trigonometric ratios of any angle. 4.2 Trigonometric ratios of allied angles, compound angles , multiple and sub-multiple angles (without proof) 4.3 Factorization and de-factorization formulae(without proof).	14

	Factorisation formulae to solve the given trigonometric relations.		
5. Inverse Trigonometric Functions	5a. Find the principle value the given Inverse trigonometric functions. 5b. Solve the given inverse trigonometric functions. 5c. Evaluate the value of given inverse trigonometric functions.	5.1 Concept of inverse trigonometric functions, Principle values of inverse trigonometric functions. 5.2 Properties of inverse trigonometric functions. 5.3 Relation between inverse trigonometric functions	05
6. Statistics	6a. Find mean or Combined Mean of given Statistical data. 6b. Find the Range, Co-efficient of Range, Mean Deviation, Standard Deviation of given Statistical data. 6c. Find variances, coefficient of variation of given Statistical data. 6d. Compare the given Two sets and Check the Consistency & Reliability OR Interpret the result by co-efficient of variations.	6.1 Measures of central tendency Mean (only), & Combined mean 6.2 Measures of dispersion:- Range, mean deviation, standard deviation of Discrete, Grouped & Ungrouped Data. 6.3 Variance and coefficient of variation, of Discrete, Grouped & Ungrouped Data. 6.4 Comparison of two sets of observations, Consistency & Reliability	09
		Total Hrs.	48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Assignments	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Solve examples using laws of logarithm.	Logarithm	01
2	Find partial fraction of proper fraction.	Partial fraction	01
3	Find partial fraction of improper fraction.		01
4	Expand determinant of order 2 and 3.	Determinant and Matrix	01
5	Perform all algebraic operations on matrices.		01
6	Find transpose, ad-joint and inverse of matrix.		01
7	Solve simultaneous equations in two and three variables.		01
8	Verify trigonometric identities.	Trigonometry	01
9	Use allied angle and compound formulae.		01
10	Use multiple and sub-multiple angle formulae.		01
11	Apply factorization formula to solve examples.		01
12	Apply de-factorization formula to solve examples.		01
13	Find principle values of inverse trigonometric functions and verify formulae.	Inverse trigonometric functions	01

14	Find mean of any data and combined mean of two sets of data.	Statistics	01
15	Find the range, mean deviation, standard deviation and variance.		01
16	Find coefficient of variation and compare the consistency.		01
Total Hrs.			16

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Logarithm	04(00)	00(00)	00(03)	04(03)
2	Partial Fraction	00(04)	03(00)	03(00)	06(04)
3	Determinant and Matrix	02(02)	06(03)	06(03)	14(08)
4	Trigonometry	02(00)	12(06)	06(06)	20(12)
5	Inverse Trigonometric Functions	02(00)	00(03)	03(00)	05(03)
6	Statistics	02(00)	03(03)	06(03)	11(06)
	Total	12(06)	24(15)	24(15)	60(36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
1	1	R	2	1	R	2	2	R	2	2	R	2	3	R	2	3	R	2	6/9
	4	R	2	5	R	2	6	R	2										
2	2	U	3	3	U	3	3	U	3	1	A	3	2	A	3				3/5
3	3	U	3	4	U	3	4	U	3	4	U	3	3	A	3				3/5
4	4	U	3	4	U	3	4	U	3	4	A	3	4	A	3				3/5
5	5	U	3	6	U	3	6	U	3	5	A	3	6	A	3				3/5
6	3	A	6	4	A	6	6	A	6										2/3

T- Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Who m	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcome s
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Sheets	1, 2, 3, 4,5,6
		Class Room Assignment s		Tutorial Assignments	15	--	Assignme nt Book	1, 2, 3, 4,5,6
	TEE (Term End Examination)	End Exam	Stude nts	End of the Course	60	24	Theory Answer Sheets	1, 2, 3, 4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	--	--	--	--
		Journal Writing		Assignments	--	--	--	--
				Total	--	--		
	TEE (Term End Examination)	End Exam	Stude nts	End of the Course	--	--	--	--
Indirect Assessment	Student Feedback on course		Stude nts	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
	Nil	

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	1	2	3
1	3	-	-	-	-	-	-			
2	3	-	-	-	-	-	-			
3	3	-	-	-	-	-	3			
4	3	-	-	-	-	-	-			
5	3	-	-	-	-	-	-			
6	3	-	-	-	-	1	3			

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Higher Algebra	Hall & Knight, Publisher: Arihant, 6 th Edition 2021	9789351762539
2	Plane Trigonometry	S.L.Loney, Publisher: Arihant, 5 th Edition 2015	9352030540
3	Basic Statistics	B.L.Agarwal, Publisher: Anshan	1848290675
4	Basic Mathematics	G.V.Kumbhojkar, P. Jamnadas LLP., 21 st Edition 2017	978-81-934573-5-1
5	Fundamental of Statistics	S.C.Gupta, Himalaya Publishing House, 7 th Edition 2015	9789350517697

❖ **E-REFERENCES:**

- https://econtent.msbte.ac.in/econtent/econtent_home.php
- <https://www.khanacademy.org>
- https://www.youtube.com/watch?v=5_TuK1yCPD4

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Mr.S.M.Sayyed	I/C Mathematics Dept.	Govt. Polytechnic Nagpur
2	Mr.P.T.Khobragade	Lecturer	Govt. Polytechnic Nagpur
3	Mr.G.R.Dewalkar	Lecturer	Govt. Polytechnic Sakoli
4	Dr.P.B.Bahatkar	Professor	Y. C. C. E. Nagpur
5	Mr.W.T.Gaidhane	Lecturer	Nagar Parishad Junior College, Arvi

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : DIPLOMA IN AI,CE,ME,EE,EC,PK,MC,MT,IT,AU,CM,
TX,TR

COURSE CATEGORY : HUMANITIES & SOCIAL SCIENCE COURSE

COURSE CODE : EN101G

COURSE TITLE : ENGLISH

TEACHING SCHEME : TH: 02 TU: 00; PR: 02 (CLOCK HRs.)

TOTAL CREDITS : 03(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)

TH. TEE : 02 HRs

PR. TEE : 02 HRs

PT. : 01 HR

❖ RATIONALE:

English as a means of communication and interaction is imperative in the holistic development of an individual. While giving a practical view of the world around him it also helps define well their role in the world. While teaching this course, emphasis will be laid on enhancing expression of ideas in English by the students. Excellence in this language enables a professional to develop his career as well as builds a strong standing in society.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Incorporate Grammatically correct structures in usage.
2. Acquire comprehension ability.
3. Assess the idea and information given.
4. Demonstrate usage of language effectively.
5. Formulate language into meaningful structures.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs
1. Application of Grammar	1a. Incorporate correct sentence pattern in writing and speaking. 1b. Identify & use tenses in various situation. 1c. Formulate direct and indirect speeches according to the situations. 1d. Draft multiple and meaningful sentences	1.1 Articles & Prepositions 1.2 Tenses: Appropriate uses of tenses in given situations. 1.3 Voice: use of active and passive voice. 1.4 Narration: direct & indirect speech	06
2. Text	2a. Interpret oral summary of topics read or heard. 2b. Adjust speed of reading. 2c. Follow oral instructions and explain them to others. 2d. Comprehend the lecture and make notes while listening. 2e. Inculcate ethical and inspirational values	2.1 Text: Learning to read fluently and to develop insight through. Selected prose prescribed in the text. 1. Dale Carnegie's : Six ways to make people like you 2. When Life gave me Lemons- Rashmi Raj 3. Two Gentlemen of Verona- A.J. Cronin 4. To be a Somebody, Remain a Nobody by K S Ram 5. Brief answers to questions: AI	09
3. Comprehension of Passage	3a. Articulate single or multiple sentences. 3b. Comprehend main ideas and demonstrate them. 3c. Analyze and assess the information and ideas gathered from the given articles.	Articles for reading 3.1 Be Remarkable 3.2 Our Muddled Generation 3.3 Employers look for potential Employees	06
4. Speaking Skills	4a. Apply correct pronunciations. 4b. Compose sentences with correct intentions and sense. 4c. Associate correct accent/stress to the	Sample situations for conversational practice 4.1 Introducing yourself and others. 4.2 Meeting and parting. 4.3 Requesting information 4.4 Inquiries and information. 4.5 Asking, Giving and Refusing	06

	given words.	4.6 Permission. Apologizing to an individual/ office.	
5. Writing Skills	5a. Develop and expand ideas into paragraphs. 5b. Exercise speeches as per given situation.	5.1 Paragraph writing: Elaborate and expand ideas, Types of paragraphs 5.2 Speech writing: Introducing the guests and vote of thanks.	05
Total Hrs.			32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Perform Tense Busters -All levels(To be performed in language lab)	Application of Grammar	06
2	Transform given sentences into active and passiveVoice	Application of Grammar	02
3	Practice narration(Direct & Indirect Speech)	Application of Grammar	02
4	outline an introduction- for self & others	Speaking Skills	02
5	Build Vocabulary for different situations	Text	04
6	Read and make notes on given topic	Text	02
7	Write a paragraph on given topic	Writing Skills	06
8	Conduct a Book Review	Writing Skills	02
9	Practice Dialogue Writing & presentation	Writing Skills	02
10	Conduct Comprehension of Passage	Comprehension passage	02
11	Prepare Speech and Present: 1) Introduction of guests 2) Vote of thanks	Speaking Skills	02
Total			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Application of Grammar	02(00)	03(00)	00(02)	05(02)
2	Text	04(02)	06(03)	00(00)	10(05)
3	Comprehension of Passage.	02(00)	06(00)	00(00)	08(00)
4	Speaking Skills	00(00)	00(00)	03(04)	03(04)
5	Writing Skills	00(00)	00(00)	04(03)	04(03)
	Total	08(02)	15(03)	07(09)	30(14)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER

T- Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Options
1	1	R	2	2	R	2	2	R	2	3	R	2	1	A	2	2	R	2	4/6
2	2	U	3	3	U	3	1	U	3	2	U	3							3/4
3	4	A	3	2	U	3	3	U	3	5	A	3							3/4
4	5	A	4	4	A	4													1/2

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	15	--	Test Answer Scripts	1, 2, 3,4,5
		Class Room Assignments		Assignments	05	--	Assignment Book	1, 2, 3,4,5
	TEE (Term End Examination)	End Exam	Students	End of the Course	30	12	Theory Answer Scripts	1,2,3,4,5
				Total	50	20		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5
		Journal Writing		Assignments	05	--	Journal	1, 2, 3,4,5
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	25	10	Practical Answer Scripts	1,2,3,4,5
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5
	End of Course Survey			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Performance	05
2	Overall presentation of given assignment	05
3	Viva voce	10
4	Activity	05
	TOTAL	25

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	1	2	3
1	3	-	-	-	-	-	3			
2	3	-	-	-	3	-	3			
3	-	2	-	-	3	-	-			
4	-	-	-	-	3	-	3			
5	3	2	-	-	-	-	-			

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	How to Win Friends and Influence people: Six ways to make people like you	Dale Carnegie, Rupa; First edition (20 May 2016)	978-8129140173
2	When life gave me lemons	https://storymirror.com/read/english/story/when-life-gave-me-lemons/krd7xe09 ,	
3	Two gentleman of Verona	A.J.Cronin, Oxford University Press 2013	
4.	To be a somebody remain a nobody	K.S.Ram[Author] Times of India [Publisher] 20edition December 2004	
5	Brief answers to questions: Artificial Intelligence	Stephen HawkingHodder&Stoughton, 16 October 2018	9781529345421
6	Our muddled generation.	Dinesh Kumar,Manish Sabharwal,Golden Harvest,	9788125059523

7	High School English Grammar and Composition	Wren and Martin Revised by Dr.N.D.V.PrasadaRao,	High School English Grammar and Composition
8	Contemporary English Grammar-structure and composition	David Green Revised Edition,2004 Himalaya Publication	033392183-6
9.	Interactive English	S.K.Gangal, Revised Edition 1997 Allied Publishers	81-7023-678-9
10	Applied English Grammar and composition.	Dr. P.C. Das, 2013, New Central Book Agency.	978-81-7381-542-3
11	English for Practical Purposes	Z. N. Patil, B.S. Valke	033935098

❖ **E-REFERENCES:**

- <https://storymirror.com/read/english/story/when-life-gave-me-lemons/krd7xe09>, Assessed on 25th July, 2021
- www.talkenglish.com-grammar , Assessed on 12th July, 2021
- www.perfect-english-grammar.com , Assessed on 18th March, 2021

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr.RupaliLondhe	Lecturer in English & Coordinator	Government Polytechnic, Nagpur.
2	Prof NitinPote	Expert, Lecturer in English	Government Polytechnic, Bramhapuri
3	Prof Ravindra Suryawanshi	Expert, Lecturer in English	NIT Polytechnic, Nagpur
4	Prof NitinPathak	Expert, Lecturer in English	Kamptee Polytechnic, Nagpur
5	Dr.M.M.Machale	Lecturer in English	Government Polytechnic, Nagpur.
6	Mrs. Kamala Grace	Visiting Lecturer in English	Government Polytechnic, Nagpur.
7	Mrs.Swati Mahatme	Visiting Lecturer in English	Government Polytechnic, Nagpur.
8	Ms.Rasika Joshi	Visiting Lecturer in English	Government Polytechnic, Nagpur.
9	Mrs.Barnali Roy	Visiting Lecturer in English	Government Polytechnic, Nagpur.

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN EC, CM, IT,AIML
COURSE CATEGORY	: ENGINEERING SCIENCE COURSE
COURSE CODE	: EE101G
COURSE TITLE	: BASIC OF ELECTRICAL ENGINEERING
TEACHING SCHEME	: TH: 03; TU: 00; PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 04 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs
PT. EXAM	: 01 HR

❖ **RATIONALE:**

Knowledge of electrical engineering is essential for the students of Electronics/ Computer/ Information technology. As they have to work in different engineering fields and deal with various types of electrical machines and equipment. Students should know the facts, concepts, principles and procedures in electrical engineering. This course describes the basic facts, concepts & principles for the understanding of basic elementary knowledge related to electrical area. It is very useful course for Solving & understanding the different electrical and electronic circuits.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Follow the electrical safety precautions.
2. Use principles of magnetic circuits.
3. Solve the electrical circuits by using principle and basic laws.
4. Select relevant type of transformers and motors for a given application.
5. Connect electrical measuring instruments in the circuit.
6. Use relevant protective devices/switchgear for different requirements.

❖ **COURSE DETAILS:**
A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. Electrostatics & Electromagnetism	1a. Define terms related to electrostatics. 1b. Observe charging and discharging of capacitor. 1c. Solve series, parallel capacitive circuits. 1d. Apply laws of Electromagnetism. 1e. Apply Fleming's right hand rule and Lenz's law to determine direction of induced EMF in a given circuit.	1.1 Capacitance, dielectric constant, capacitance of parallel plate capacitor, capacitance in series and parallel and source of capacitance in electrical systems. 1.2 Charging & discharging of capacitor, Dielectric loss. Types of capacitors and their application. 1.3 Faraday's Laws of electromagnetic induction. Direction of induced EMF and current, Lenz's Law, Fleming's right hand rule, Induced EMF, dynamically induced EMF, statically induced EMF, self- Inductance (L), Mutual Inductance.	08
2. Fundamentals of Electricity	2a. Define the various electrical Parameters. 2b. State Law of resistance and explain Effect of temperature on resistance. 2c. Calculate the temperature coefficient of resistance. 2d. Solve series, parallel and series- parallel resistive circuits. 2e. State KCL and KVL 2f. Define work, power, and energy. 2g. Connect ammeter, voltmeter and wattmeter in an electric circuit. 2h. Compare between AC and DC supply. 2i. Maintenance of Battery	2.1 Concept of electric charge, current, voltage drop, EMF, potential difference, Direction of current and their SI units. 2.2 Resistance, unit of resistance, Law of resistance (Factors affecting resistance), Effect of temperature on resistance, Ohms law 2.3 Resistance in series and parallel, properties of series circuit and parallel circuit,, voltage distribution in series circuit, Current distribution in parallel circuit equivalent resistance of series circuit, equivalent resistance of parallel circuit Applications of series circuits, and parallel circuits, (Numerical based on 2.2 & 2.3) 2.4 Kirchhoff's current and voltage law (no Numerical) 2.5 Work, power, energy and their SI units, Relation between H.P and watts, Kwh and Kcal. 2.6 Connection of ammeter, voltmeter, and wattmeter in single phase AC circuit. and its measurement. 2.7 Concept of AC and DC supply Comparison between AC and DC supply	12

		2.8 Concept of Battery and Cell , Types of battery and their applications	
3. AC Fundamentals	3a. Describe generation of alternating voltage- single phase and three- phase. 3b. Define terms related to AC fundamentals. 3c. Compare terms time period and frequency, angular velocity and frequency, frequency and speed. 3d. Define Maximum, average and R.M.S. value of sinusoidal waveform, form factor and peak factor. 3e. Explain the response of given purely resistive, inductive and capacitive AC circuit with sketches. 3f. Solve problems related to pure resistive, inductive and capacitive circuit. 3g. Understand the concept of reactance, impedance and power factor. 3h. State types of electrical loads.	3.1 Generation of alternating voltage- single phase and three- phase. 3.2 Equation of sinusoidal alternating voltage and current, important terminology such as- waveform, instantaneous value, cycle, time period, frequency, amplitude, Relation between time period and frequency, angular velocity and frequency, frequency and speed. 3.3 Maximum, average and R.M.S. value of sinusoidal waveform, form factor and peak factor. (No derivation) 3.4 A.C. Voltage applied to pure resistor, pure inductor, and pure capacitor. Concept of reactance, Impedance and power factor, power in single-phase circuits. (Simple Numerical problem based on 3.4). 3.5 Types of loads	08
4. Transformer	4a. Explain the construction and working principle of transformer. 4b. Describe the concept of transformation ratio, KVA rating of transformer. 4c. Classify the different types of transformers. 4d. Explain Auto transformer with diagram. 4e. Solve problems related to voltage ratio, current ratio, and transformation ratio.	4.1 Transformer:-Definition, principle of operation, construction, types of transformer, 4.2 EMF equation (No derivation), voltage ratio, current ratio, and transformation ratio 4.3 KVA rating of transformer, (Simple Numerical problem based on 4.2 and 4.3 topic). 4.4 Auto-transformer –Special features, Schematic diagram and its applications.	05

5. AC and DC Motors	5a. Classify different types of AC & DC motors. 5b. Select relevant type of DC motor for a given application. 5c. Describe construction and working of DC motor. 5d. Select relevant type of AC motor for a given application 5e. State application of universal motor 5f. Explain principle of operation of Stepper motor with application. 5g. Explain the concept of reversal of direction of rotation in AC motor an DC motor.	5.1 Classification of A.C & D.C motors. 5.2 DC Motor-construction, parts its function and material used, working principle of D. C. motor. Types - shunt, series and compound motor. Application of DC shunt, series and compound motor, reversal of rotation. 5.3 AC Motor -Single-phase induction motors, principle of operation and application – Split phase IM, Capacitor star induction run, capacitor start capacitor run . 5.4 Universal motor:- Principle of operation , reversal of direction of rotation and application. 5.5 Principle of operation of Stepper Motor and its application. (No Numerical)	10
6. Electrical Safety and Protective Device	6a. Recall electrical safety rules. 6b. Interpret electrical safety signs and symbols. 6c. State the need of earthing. 6d. Describe the features of the given type of protective device. 6e. Select the relevant protective device for the given application with justification.	6.1 Electrical Safety, Causes of accidents, General safety rules, Concept of electrical shock, Effect of electric shock, Method of removing electrocuted person, Safety signs and symbols. 6.2 Earthing- Necessity of earthing, methods of reducing earth resistance. 6.3 Fuse : Operation and types 6.4 MCB, MCCB and ELCB: Operation and general specification.	05
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practical	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Identify electrical measuring instruments, sources, ICDP/ITDP, switches, loads, wires and execute safety precautions in laboratory.	Electrical Safety and Protective device	04
2	Connect voltmeter, ammeter and wattmeter in electrical circuit.	Fundamentals of Electricity	02
3	Measure the current, voltage and resistance with the help of multi-meter or tong tester.		02
4	Calculate the unknown resistance in an electric circuit using ohms law.		02
5	Calculate the temperature coefficient of resistance of conductors.		02
6	Measure the total resistance of series circuit .		02
7	Measure the total resistance of parallel circuit.		02
8	Find the branch current and mesh voltage using Kirchhoff's law (KCL & KVL).		04
9	Use test lamps for testing single-phase and three – phase supply. Use of tester on single-phase supply.		02
10	Operate CRO and Observe the current & voltage wave form for purely R,L& C ac circuit &interpret the phasor relationship.	AC Fundamentals	02
11	Calculate voltage & current ratio of single- phase transformer.	Transformer	04
12	Reverse the direction of rotation of DC shunt motor.	AC and DC Motors	02
13	Reverse the direction of rotation of single-phase capacitor start motor.		02
Total Hrs			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Electrostatics& Electromagnetism	02(02)	06(03)	00(00)	08(05)
2	Fundamentals of electricity	05(02)	06(06)	00(00)	11(08)
3	AC Fundamentals	02(00)	09(03)	00(06)	11(09)
4	Transformer	05(02)	03(03)	00(00)	08(05)
5	Drives	04(00)	03(06)	06(00)	13(06)
6	Electrical Safety and Protective device	00(00)	03(03)	06(00)	09(03)
	Total	18(06)	30(24)	12 (06)	60(36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

T- Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
1	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	5	R	2	6/9
	2	R	2	1	R	2	4	R	2										
2	1	U	3	2	R	3	2	U	3	1	U	3	4	U	3				3/5
3	1	U	3	4	R	3	3	U	3	2	U	3	5	U	3				3/5
4	2	U	3	3	U	3	5	U	3	3	U	3	6	U	3				3/5
5	6	U	3	3	U	3	4	U	3	5	U	3	2	U	3				3/5
6	6	A	6	5	A	6	3	A	6										2/3

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assign-ments	15	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	60	24	Theory Answer Scripts	1,2,3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assign-ments	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End of the Course	25	10	Practical Answer Scripts	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form		1, 2, 3, 4,5,6	
	End of Course Survey			End of the Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Drawing circuit diagram, selection of equipment, writing procedure etc.	10
2	Performance	20
3	Calculation, Result, Drawing Graphs (if any)	10
4	Viva voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	-	-	-	-	-	3	2	2
2	3	-	2	-	-	-	2	-	-
3	3	3	2	-	-	-	2	-	-
4	3	2	2	3	-	-	2	3	3
5	3	-	-	2	-	-	2	3	2
6	3	2	2	-	2	-	3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Principle of Electrical Engineering and Electronics	V. K. Mehta, S. Chand & Company Ltd., Reprint, 1996	81-219-1053-6
2	A Text Book Of Electrical Technology Vol-I	B. L. Theraja , A. K. Theraja , S.Chand& Co Ltd., Reprint,2006	81-219-2440-5
3	Basic Electrical Engineering	V. N. Mittle, Arvind Mittal, The McGraw Hill Education Pvt. Ltd, Reprint, 2011	13: 978-0-07-059357-2
4	Experiments in Basic Electrical Engineering	S. K. Bhattacharya and K. M. Rastogi., New Age International Publisher, Reprint, 2009.	978-81-224-1042-6
5	A Text Book on laboratory courses in Electrical Engineering	S.G.Tarnekar and P. K. Kharbanda, S. Chand& Company Ltd., Third, 1990	13: 978-8121901048

❖ **E-REFERENCES:**

- <https://nptel.ac.in/courses/108/108/108108076/> , accessed on 21st June 2021
- <http://www.electrical4u.com> , accessed on 21st June 2021
- <https://www.scribd.com/document/314848295/Lecture-Notes-Basic-Electrical-and-Electronics-Engineering-Notes> accessed on 21st June 2021
- <https://nptel.ac.in/courses/108/108/108108076/> , accessed on 21st June 2021.
- <https://electricalnotes.wordpress.com/articals/> accessed on 21st June 2021.

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

1. Meters: Ammeter MI 0-5-10 A, Voltmeter MI 0-150-300, Wattmeter 0-3000 W, Digital Multi-meter, Tong tester, Megger 500V/1000V Hand driven.
2. Rheostat assorted sizes, Variable Inductor, Capacitor
3. Single phase induction motor, 230 V, 50 Hz, 1 kw
4. Single phase transformer, 230/115 V, 50 Hz., 1 KVA
5. CRO, dual trace
6. DC Shunt Motor, 220 V, 3 HP

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr.D.D.Lulekar	Chairman , PBOS & HOD Electrical Engg.Deptt.	Government Polytechnic, Nagpur.
2	Mrs A.A.Alegaonkar	CDC Coordinator & Lecturer , Electrical Engg.Deptt.	Government Polytechnic, Nagpur
3	Ms. P. S. Rithe	Expert & Lecturer in Electrical Engg. Deptt	Government Polytechnic, Nagpur.
4	Shri.M.N.Gawande	Expert & Lecturer in Electrical Engg.Deptt	Government Polytechnic, Nagpur
5	Mrs.A.P.Gandhi	Expert & Lecturer in Electrical Engg.Deptt	Government Polytechnic, Nagpur
6	Mrs.P.M.Sonwane	Expert & Lecturer in Electrical Engg.Deptt	Government Polytechnic, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : **DIPLOMA IN COMPUTER ENGINEERING /
INFORMATION TECHNOLOGY / AIML**

COURSE CATEGORY: **ENGINEERING SCIENCE COURSE**

COURSE CODE : **CM151G**

COURSE TITLE : **COMPUTER WORKSHOP**

TEACHING SCHEME: **TH:00; TU: 00;PR: 04(CLOCK HRs.)**

TOTAL CREDITS : **02** (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT =2 CLOCK HR.)

TH. TEE EXAM : **--**

PR. TEE EXAM : **02 Hrs**

PT. EXAM : **--**

❖ **RATIONALE:**

As a Engineering student they have to work with various hardware and software not only during academic but also in work field. Thus, students should know the knowledge of various hardware and networking devices. It introduces basic components of computer and method and means to connect them to the system. Since the dirt can affect reliability and performance of various components, cleaning of components become one of the essential activity of basic maintenance. This course demonstrates steps in cleaning and handling various components, handling problems with component connections. It gives hands-on experience of computer operation to the students.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Assemble/ Disassemble personal computer system.
2. Identify and connect computers peripherals
3. Perform system settings by using BIOS setup.
4. Practice preventive maintenance of computer peripherals
5. Classify and connect different cards /ports on Motherboard
6. Connect personal computer in network using different cable and identify various network environment and its setup.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
NIL			

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Identify all the peripheral devices. Identify the front and rear panel controls and ports on a PC (serial, parallel, PS/2, RJ 45, USB ports)	1. Introduction to personal Computer	04
2	Identify all components mounted on Motherboard. RAM ROM Add-on Card HDD, DVD, Flash Memory, Pen drive		04
3	Assemble, Disassemble PC inside of cabinet and on desktop.		04
4	Perform system configuration using BIOS setup.		04
5	Copy data on CD, DVD. Write data on CD/DVD, single session/multisession.	2. Introduction to external peripheral devices.	04
6	Perform different printer settings on different types of printers. Write down the function of each switch. Perform printer's self test.		04
7	Connect scanner, scan documents and pictures on the scanner available in your lab. Sample printout be attached.		04
8	Connect desktop computer and laptop with LCD/DLP Projector		04
9	Identify and connect blue tooth based wireless mouse, keyboard and other devices.		04
10	Identify and distinguish different types of cables in your lab.	3. Introduction to different cables and network devices.	04
11	Make patch cable (UTP) with RJ-45 connector with help of crimping tool and connect to IO box and switches.		8
12	Follow cleaning procedures of Mouse, Keyboard, Motherboard and Slots Motherboard, Cleaning Brush, Cleaning liquid Basic cleaning Hard cleaning	4. Clean inside PC	4
13	Identify and fix different types of cards such as graphics card, LAN card, multimedia cards etc into matching slots on the motherboard.	5. Physical Connection to Motherboard	04

14	Connect power socket and controller socket to disk drives and motherboard. (Motherboard, PATA/ SATA Hard disk, Data cables)		04
15	Identify Wi-Fi and wired network environment and its setup.	6. Networks and Connectivity	04
Total Hrs			64

❖ **SPECIFICATION TABLE FOR THEORY PAPER:Nil**

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:-Nil**



❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	--	--		
		Class Room Assignments		Assignments	--	--		
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--		
				Total	--	--		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End of the Course	25	10	Practical Answer Scripts	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Identifying components, assembling/disassembling system, selection of tools and writing procedure etc.	20
2	Performance	10
3	Identify network environment and its setup.	10
4	Viva Voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:CM**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	-	-	-	-	-	3	-	-
2	3	-	-	3	-	-	3	-	3
3	3	-	1	3	-	-	3	1	3
4	3	1	-	-	-	-	3	-	-
5	3	-	-	3	1	-	3	-	-
6	3	1	1	3	-	1	3	1	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:IT**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	-	-	-	-	-	3	-	-
2	3	-	-	3	-	-	3	3	1
3	3	-	1	3	-	-	3	3	-
4	3	1	-	-	-	-	3	-	-
5	3	-	-	3	1	-	3	-	-
6	3	1	1	3	-	1	3	3	1

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:AIML**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	-	-	-	-	-	3	-	-
2	3	-	-	3	-	-	3	-	3
3	3	-	2	3	-	-	3	2	3
4	3	2	-	-	-	-	3	-	-
5	3	-	-	3	1	-	3	-	-
6	3	2	2	3	-	1	3	2	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Troubleshooting Your PC	Mr. David Stone & Alfred Poor, Prentice Hall India, 2000	13: 978-073-561490-1
2	A+ Complete	David Groth, BPB Publication, 2006	13: 978-0782128024
3	Computer Installation and Servicing	Balasubramaniam, Tata McGraw Hill Education Pvt. Ltd, Reprint, 2011	13: 9781259082467
4	Peter Norton's New Inside the PC	Peter Norton, Scott Clark, Sams Imprint of Simon and Schuster 201 W. 103 St. Indianapolis, IN United States	978-0-672-32289-1

❖ **E-REFERENCES:**

- <https://www.youtube.com/watch?v=a0rEXzyX0-8> , accessed on 23rd Jun 2021
- <https://www.computernetworkingnotes.com/networking-tutorials/network-cable-crimping-and-testing-tools.html>, accessed on 23rd Jun 2021
- <https://www.partitionwizard.com/partitionmanager/motherboard-components.html>, accessed on 23rd Jun 2021
- <https://www.youtube.com/watch?v=ezubjTO7rRI>, accessed on 23rd Jun 2021

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

1. Operating System(Windows 98/2000/XP/7/8/8.1/10)Voltmeter MI 0-150-300 V
2. CPU Intel core i3/i5/i7Digital Multi-meter
3. Fiber optics cable(LSFH Polymer)
4. Unshielded Twisted pairs cable(CAT 1 to CAT5)
5. Connectors(RJ45/BNC/AUI/FIBER)
6. Printers(INK JET/LASER), LCD/DLP Projector, Scanner(FLAT BED)
7. Crimps, Strips and cut tools(HT-200R, HT-2008R), Basic cable tester

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr.M.V.Sarode	Head of Computer Engineering	Government Polytechnic, Nagpur.
2	Dr.A.R.Mahajan	HOD, Information Technology/AIML	G.P.Nagpur
3	Mrs.S.S.Mete	Lecturer, Computer Engineering	Government Polytechnic, Nagpur.
4	Mr.L.L.Bhadekar	Lecturer, Information Technology	Government Polytechnic, Nagpur.
5	Mr.Dipak Dhote	Operations Manager	IT Networks Infosystem Pvt. Ltd. Nagpur
6	Dr. Rakesh Kadu	Assistant Professor, IT	Ramdeobaba College of Engineering and Management, Nagpur
7	Mrs. V. A. Raje	Lecturer, Computer Engineering	Government Polytechnic, Arvi

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN EE/CM/IT/EC/MT/TX/AI
COURSE CATEGORY	: ENGINEERING SCIENCE COURSE
COURSE CODE	: ME151G
COURSE TITLE	: ENGINEERING GRAPHICS
TEACHING SCHEME	: TH:00; TU: 00;PR: 04(CLOCK HRs.)
TOTAL CREDITS	: 02(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: --
PR. TEE EXAM	: 02 HR
PT. EXAM	: --

❖ RATIONALE:

Engineering graphics is a non-verbal and graphical language to communicate ideas, instructions and facts with each other clearly and without ambiguity while carrying out engineering jobs on the sites, shop floor etc. It describes the fundamentals, facts, concepts, principles and techniques of Engineering Graphics. The course illustrates techniques of drawing in an engineering field. It helps to develop the idea of visualizing the actual object or part on the basis of drawings and blueprints. This course is useful in developing drafting and sketching skills of the student. This preliminary course aims at building a foundation for the further course in drawing and other allied courses.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Apply various drawing codes, conventions and symbols as per IS SP-46 in engineering drawing.
2. Redraw the given drawing by using appropriate geometrical construction.
3. Sketch different types of engineering curve by different methods.
4. Draw isometric projections into orthographic projections.
5. Visualize three dimensional objects and draw isometric projections.
6. Draw freehand sketches of a given engineering element.

❖ **COURSE DETAILS:****A. PRACTICALS :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	PR Hrs
1. Principles of Drawing	1a. Use of instruments for drawing, scales, lines and their applications. 1b. Use of IS:SP-46. 1c. Loci of points from given data.	1.1 Use of different drawing instruments and equipment 1.2 Types of letters and numbers (single stroke vertical and numbers only) 1.3 Conventions of lines, 1.4 Dimensioning technique as per IS:SP-46 1.5 Scales :(reduced, enlarged and full size)-Plain scale, diagonal scale.	06
2. Redraw and Loci of Points	2a. Learn different geometrical construction methods. 2b. Drawing locus of point from given data.	2.1 Different geometrical construction Methods and Redrawing. 2.2 Loci of points	06
3. Engineering Curves.	3a Draw an ellipse by given method. 3b Draw parabola by given method. 3c Draw hyperbola by given method. 3d Draw involute, and state their applications. 3e Draw a given cycloid and state its applications .	3.1 To draw an ellipse by- i) Arcs of circles method ii) Concentric circles method 3.2 To draw parabola- i) Rectangle method ii) Directrix- focus method 3.3 To draw hyperbola by- i) Passing through a given point With reference to given asymptotes ii) Directrix- focus method 3.4 To draw involutes of circle and Polygon of maximum six sides 3.5 To draw cycloid, epi-cycloid and hypo-cycloid	12
4. Orthographic Projections.	4a. Visualize, interpret and draw orthographic views from given pictorial views. 4b. Difference between first angle and third angle method of projection. 4c. Use of IS:SP-46 for dimensioning technique.	4.1 Introduction to orthographic Projection. 4.2 First angle and Third angle method of projections. 4.3 Conversion of simple pictorial views into orthographic views and dimensioning techniques as per IS. SP-46	14

5. Isometric Projections	5a. Visualize, interpret and draw Isometric views from given orthographic views.	5.1 Isometric scales 5.2 Isometric views of simple object (plane surfaces, slanting surfaces, and Rectangular, V, Trapezoidal slots)	14
6. Freehand Sketches	6a. Prepare proportionate freehand sketches of given machine elements. 6b. Describe functions and use of machine element.	6.1 Types of screws and threads profile– Vee and square, acme, buttress, seller, BA threads, knuckle threads. 6.2 Bolts–square and hexagonal bolts, eyebolt 6.3 Types of nuts: square, hexagonal, wing 6.4 Foundation bolts: Eye foundation bolt, Rag foundation bolt, Lewis foundation bolt 6.5 Single and double Riveted Lap and Butt joints	12
Total Hrs.			64

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Draw types of lines, lettering, numbers and two problem from sub topics 1.5 of Unit 1 (01 Sheet)	1 Principles of drawing	06
2	Draw two problems each from subtopic 2.2 and 2.3 from Unit 2 (01 Sheet)	2 Redraw and Loci of Points	06
3	Draw Engineering Curves, one problem from each sub topic of Unit 2. (01 Sheet)	3 Engineering Curves	12
4	Draw two problem using first angle method of projection (01 Sheet)	4 Orthographic Projections	14
5	Draw one problem with plane surfaces & other with slot, slanting surfaces (using natural scale and isometric scale) (01 Sheet)	5 Isometric Projections	14
6	Draw Free Hand Sketches–any ten sketches covering all the topics under Unit 6 (01 Sheet)	6 Free Hand Sketches	12
Total Hrs.			64

❖ **SPECIFICATION TABLE FOR THEORY PAPER:**

Nil

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER**

Nil

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	-	--	-	-
		Class Room Assignments		Continuous	-	--	-	-
	TEE (Term End Examination)	End Exam	Students	End of the Course	-	-	-	-
				Total	-	-		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Drawing Sheets	1, 2, 3,4,5,6
		Drawing Portfolio		Assignments	05	--	Drawing Portfolio	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End of the Course	25	10	Drawing Answer sheets	1, 2, 3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form		1, 2, 3, 4,5,6	
	End of Course			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max.Marks
1	Neatness , cleanliness and line work on drawing sheet	10
2	Creation of given drawing with proper dimensioning	20
3	In time submission	10
4	Viva Voice	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcome s (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	3	2	-	—	—	2	—	—
2	3	3	3	-	—	—	2	—	—
3	3	3	3	-	—	—	3	—	—
4	3	3	3	-	—	—	3	-	—
5	3	3	3	-	—	—	2	-	—
6	3	3	3	-	—	—	2	-	—

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Engineering Drawing Practice for Schools And Colleges IS:SP-46	Bureau of Indian Standards, Reprint in , 2003	8170610192
2	Engineering Drawing	N.D.Bhatt, Charotar Publishing house 53 rd Edition 2019	9789380358963
3	Geometrical and Machine Drawing	N.D.Bhatt & V.M Panchal, Charotar Publishing house, 20 th Edition 2014	9789380358895
4	Engineering Drawing	D.A.Jolhe, Tata McGraw Hill Edu.2010	978-0-07-064837-1
5	Engineering Drawing	R.K.Dhawan , Published by S.Chand & co. 2012	9788121914314
6	Engineering Drawing	P.J Shaha, S.Chand & co. 2013	8121941822

❖ **E-REFERENCES:**

- <https://www.youtube.com/watch?v=ANEvQyt3PnU> accessed on 30 June 2021
- <https://www.youtube.com/watch?v=-W7tH49dBLw> accessed on 30 June 2021.
- <https://www.youtube.com/watch?v=FXP3tKedM5g> accessed on 30 June 2021.

- <https://www.youtube.com/watch?v=j5nwO-JwVv4&list=PLDN15nk5uLiBpnIOK5r3KXdfFOVzGHJSt> accessed on 30 June 2021.
- [https://www.youtube.com/watch?v=77ufJXvXUk4&list=PLIhUrsYr8yHxVky7bfrnbRcdXcHjT_K83&index=2\(Iso\)](https://www.youtube.com/watch?v=77ufJXvXUk4&list=PLIhUrsYr8yHxVky7bfrnbRcdXcHjT_K83&index=2(Iso)) accessed on 30 June 2021.
- <https://www.youtube.com/watch?v=Jzr5PTbvkVI&list=PL1xA-ZWMKpOMt3ew5vcn3keBxlqHKtlg> accessed on 30 June 2021.

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

- 1 Drawing Board with drawing instruments
- 2 Mini-drafter

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Shri. P.V. Rekhade	HOD, Mechanical Engineering	Government Polytechnic, Nagpur
2	Dr. R. G. Choudhari	HOD, Mechanical Engineering	Government Polytechnic, Nagpur
3	K. S. Thekedar	Course Expert & Lecturer in Mechanical Engineering	Government Polytechnic, Nagpur.
4	Y. K. Gaiki	Course Expert & Lecturer in Mechanical Engineering	Government Polytechnic, Nagpur.
5	Er. A.M.Onkar	PBOS Member & Chief Executive Officer	Onkar Furnitures, MIDC, Nagpur
6	Shri. G.F. Potbhare	PBOS Member & Principal	NIT, Polytechnic, Nagpur
7	Shri. G.H. Dahole	MSBTE Representative & Lecturer in Mechanical	Govt. Polytechnic, Gondia

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : DIPLOMA IN CE/ME/EE/EC/CM/IT/MT/PK/AE/TR/
TX/MK

COURSE CATEGORY : HUMANITIES & SCIENCE COURSE

COURSE CODE : LS151G

COURSE TITLE : LIFE SKILLS

TEACHING SCHEME : TH:00; TU:00;PR: 02 (CLOCK Hrs.)

TOTAL CREDITS : 01(TH/TU CREDIT = 0 , 1 PR CREDIT = 2 CLOCK HR.)

TH. TEE EXAM : --

PR. TEE EXAM : --

PT. EXAM : --

❖ RATIONALE:

According to NASSCOM and other agency surveys conducted, suggests that today's Diploma engineers are technically solid, can do linear programming problems, solve issues quickly but lack in Interpersonal and Communication skills. The list of required life skills include communication, leadership, team work, public speaking, attitude, ethics, professional etiquettes etc. This 'disconnect' between the desired skills and the qualifications and skills obtained needs to be addressed. Bridging the gap between Formal technical education and Industry's requirements, an interface between Industry and Institute is very essential. A pre-employment training in these life skills therefore becomes the essential part of the curriculum of Diploma programmes. to prepare job ready students for industries. This will enhance the employability and the industry connect for the students and will reduce the gestation period of students in Corporate world.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Acquire knowledge of Self discovery.
2. Build essential soft skills.
3. Enhance professional competencies

4. Adapt ethics and values.
5. Develop interpersonal skills.
6. Maintain physical and mental fitness.

❖ **COURSE DETAILS:**

A. THEORY :

Units	Specific Learning Outcomes(Cognitive Domain)	Topics and subtopics	Hrs
Nil			

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

S.No.	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	1. Prepare a draft of personal information. 2. Practice and perform self introduction. 3. Demonstrate appropriate body language during self intro and introducing others.	A. Soft Skills Understanding self & Others a. Self Introduction b. Introducing others	2 hrs
2	1. Practice Yoga Asanas recommended in AYUSH Common Yoga Protocol (Tadasana, Vrikshasana, Pada-hastasana, Trikonasana, Ardha-Chakrasana etc) for good health and fitness. 2. Prepare a diet chart for - Teenagers/Old age people/Diseased person etc. 3. Prepare a table of Do's and Don'ts of Habit formation.	B. Life Skills Mental & Physical Health a. Warm up b. Yoga c. Habit formation- Do's & Don'ts d. Diet Pyramid	4 hrs
3	1. Practice Pranayamas recommended in AYUSH Protocol (Anulom vilom, Kapalbhathi, Bhramari Pranayama, Bhastrika, Surya Bhedan etc) for good health and fitness. 2. Practice different types of meditation -Mindfulness meditation, Loving Kindness Meditation, Yoga Meditation.	B. Life Skills Mental & Physical Health a. Pranayam b. Meditation	4 hrs
4	1. Practice and perform Group Discussions on topics/ issues of	A. Soft Skills Personality	2 hrs

	relevance. 2. Demonstrate appropriate dress and appearance for formal conversation. 3. Exhibit suitable non verbal codes of communication.	Development a. Group Discussion b. Personal grooming c. Verbal-Non Verbal communication	
5	1. Draft pros and cons on given topic of Debate. 2. Practice sessions on Debate on current affairs.	C. Employability Skills Interpersonal Skills a. Public Speaking b. Analytical thinking	2 hrs
6	1. Prepare draft for seeking permission to organize academic activity/event/visit etc. 2. Prepare checklist of things to do and schedule for organizing academic activity/event/visit etc. 3. Exercise activities (2 to 3) based on confidence building- such as Interviewing of field experts, organizing industrial visits and submitting reports etc.	C. Employability Skills Effective Management a. Planning b. Motivating self & others	4hrs
7	1. Jot down the qualities and skills of successful entrepreneur to prepare presentation on his/her achievements and contribution. 2. Prepare and present presentation on Learning lessons from Biographies of industrialists (like Rusy Modi, Dhirubhai Ambani, Ratan Tata, Narayana Murthy etc.	D. Presentation Skills - Corporate Culture a. Attitude b. Creativity & Innovation	4hrs
8	1. Investigate and examine industry related issues and prepare a case study on it. 2. Present case studies based on industry related issues like-indefinite labour strike, accidents , customer complaints, employees' career requirements.	D. Presentation Skills - Problem Solving a. Critical Thinking b. Problem Analysis	2 hrs
9	1. Jot down the lacunas of the entrepreneur which caused fall in business. 2. Prepare and present presentations on Learning lessons from failure business stories.	D. Presentation Skills - Learning Attitude a. Adaptability b. Persistence	2 hrs

10	1. Participate and practice in basket exercises / Games related to Team Working & Leadership. 2. Exhibit leadership qualities in group task.	A. Soft Skills Interpersonal Skills a. Working in a team b. Leadership	2hrs
11	1. Demonstrate exercises on Problem solving in Assertive communication (Role Play). 2. Incorporate assertive communication in given situation.	A. Soft Skills Interpersonal Skills a. Positive Thinking b. Assertiveness	2 hrs
12	1. Set short term and long term career goals. 2. Practice sessions on Time management (Prepare schedule to achieve short term and long term goals).	A. Soft Skills Effective Time Management a. Goal Setting b. Time Management	2 hrs
Total Hrs.			32

❖ **SPECIFICATION TABLE FOR THEORY PAPER:** Nil

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:** Nil



❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Who m	Frequency	Max Mark s	Min Mark s	Evidence Collected	Course Outcome s
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)		--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assignments		--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course			Theory Answer Scripts	1,2,3,4,5, 6
				Total				
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End of the Course			Practical Answer Scripts	1,2,3,4,5, 6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Presentation Skills	10
2	Communication	10
3	Motivation	10
4	Confidence/Enthusiasm	05
5	Interpersonal Skills	10
6	Viva voce	05
Total		50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	1	2	3
1	-	-	-	-	-	2	3	-	-	-
2	-	-	-	-	-	2	3	-	-	-
3	-	-	-	-	-	3	3	-	-	-
4	-	-	-	1	1	3	3	-	-	-
5	-	-	-	-	-	3	3	-	-	-
6	-	-	-	-	-	2	3	-	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Yoga Therapy	Angarai, G. M. and Indra Mohan, Shambhala Publications, 2 nd Edition, January 1, 2014.	ISBN-13 9781590301319
2	The ACE of Soft Skills: Attitude, Communication and Etiquette for Success	Gopalaswamy R. and Mahadevan Pearson Publication, 1 st Edition, 13 May 2010.	ISBN-13 978-8131732854
3	Simple Art of Business Etiquette: How to Rise to the Top by Playing Nice	Jeffrey L Seglin, Tycho Pr Publication, 12 January 2016	ISBN-13 978-1623156886
4	The Big Book of Team-Motivating Games	Edward Scannell and Mary Scannell, McGraw-Hill Education, 7 October 2009	-----

5	Team Building: Proven Strategies for Improving Team Performance	W. Gibb Dyer , Jeffrey H. Dyer , and William G. Dyer, 5th Edition, Jossey-Bass, 3 January 2013	ISBN-13 978-1118105139
6	How to Win Friends & Influence People	Dale Carnegie, Pocket Books October 1, 1998	ISBN-10 0671027034
7	Famous Industrialists: Famous Biographies for Young People	Sigmund A. Lavine, Literary Licensing, LLC, 13 October 2012	ISBN-13 978-1258497026
8	Why Entrepreneurs Really Fail	Buchia Nozer, Bloomsbury, October 1, 1998	ISBN-13 9789382951605

❖ **E-REFERENCES:**

- <http://ihmshimla.org/wp-content/uploads/2013/05/Industrial-Training-Rule-Book.pdf>, accessed on 25th July, 2021
- <https://www.oliveboard.in/blog/from-rags-to-riches-indias-most-inspiring-success-stories>, accessed on 23rd May, 2021
- <https://coach.basketball.net.au/10-simple-team-building-activities-for-your-under-14s>, accessed on 14th June, 2021

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

Nil

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Prof. Deepak Kulkarni	Soft Skills Trainer & Councilor	Consultant, Nagpur
2	Dr. Shabbir Zukerya	Director	Learner's Academy for Skill Development, Nagpur
3	Mr. Anand Toal	Director	International Placements, Nagpur
4	Dr. Megha Machale (Bhelande)	Lecturer in English	Government Polytechnic, Nagpur.
5	Prof. Yogesh Chandarana	In-Charge, Curriculum Development Cell	Government Polytechnic, Nagpur.
6	Mr. Manish Gawande	In-Charge, Curriculum Development Cell	Government Polytechnic, Nagpur.

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GOVERNMENT POLYTECHNIC, NAGPUR.

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COURSE CURRICULUM

**PROGRAMME : DIPLOMA IN EC/IT/MC/EE/CM/CE/ME/AE/PK/
TR/TX/MT/AI**

COURSE CATEGORY: AUDIT COURSE

COURSE CODE : IC151G

COURSE TITLE : INDIAN CONSTITUTION

TEACHING SCHEME: TH:01; TU: 00; PR: 00 (CLOCK HRs.)

TOTAL CREDITS : -

TH. TEE EXAM : -

PR. TEE EXAM :-

PT. EXAM : -

❖ **RATIONALE:**

The Constitution of India is the supreme law of India. The document lays down the framework that demarcates fundamental political code, structure, procedures, powers, and duties of government institutions and sets out fundamental rights, directive principles, and the duties of citizens. Engineer has to perform different works related to project planning, constructing project work, lead a group of workers etc. Engineer must also know about different bodies of administration, fundamental rights of citizen, different levels of Indian Union. Hence every Diploma Holder should have knowledge about Indian Constitution.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Interpret policies of government.
2. Outline structure of Indian Union.
3. Describe functions of State Secretariat and different Ministries .
4. Describe structure of District Administration.
5. Describe role and functions of Chief Election Commissioner.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Topics and Subtopics	Hrs.
1. The Constitution - Introduction	1.1 The History of the Making of the Indian Constitution 1.2 Preamble and the Basic Structure, and its interpretation 1.3 Fundamental Rights and Duties and their interpretation 1.4 State Policy Principles	04
2. Union Government	2.1 Structure of the Indian Union 2.2 President – Role and Power 2.3 Prime Minister and Council of Ministers 2.4 Formation of Lok Sabha and Rajya Sabha and its functions	04
3. State Government	3.1 Role and Power of Governor 3.2 Role and Functions of Chief Minister and Council of Ministers 3.3 Functions and Powers of State Secretariat	03
4. Local Administration	4.1 Structure of District Administration 4.2 Functions of Municipal Corporation 4.3 Functions of Zila Parishad	03
5. Election Commission	5.1 Role and Functions of Chief Election Commissioner 5.2 Role and Functions of State Election Commission	02
	Total	16

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Assignment on each topic (Total 5 Assignments)

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	--	--	--	--
		Class Room Assignments		Assignments	--	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	Theory Answer Scripts	1,2,3,4,5,6
				Total	--	--		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	--	--	--	--
		Journal Writing		Assignments	--	--	--	--
				Total	--	--		
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	--	--
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course Survey			End of The Course	Questionnaires			

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	1	2	3
1	-	-	-	-	3	-	3	-	-	-
2	-	-	-	-	3	-	3	-	-	-
3	-	-	-	-	3	-	3	-	-	-
4	-	-	-	-	3	-	3	-	-	-
5	-	-	-	-	3	-	3	-	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Ethics and Politics of the Indian Constitution	Rajeev Bhargava, Oxford University Press, New Delhi, 2008	
2	The Constitution of India	B.L. Fadia, Sahitya Bhawan; New edition (2017)	
3	Introduction to the Constitution of India	DD Basu, Lexis Nexis; Twenty-Third 2018 edition	

❖ **E-REFERENCES:**

- <https://www.constitution.org/cons/india/const.html>
- <http://www.legislative.gov.in/constitution-of-india>
- <https://www.sci.gov.in/constitution>
- <https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-of-india/>

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr.D.D.Lulekar	HoD, Electrical Engg. Deptt.	Government Polytechnic, Nashik.
2	Prof.A.M.Arekar	Lecturer In Electrical Engg.	Government Polytechnic, Nagpur
3	Mr.M.N.Gawande	Lecturer In Electrical Engg.	Government Polytechnic, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CE/ME/ CM / IT/AE/PK/MT/AI
COURSE CATEGORY	: BASIC SCIENCE COURSE
COURSE CODE	: MH102G
COURSE TITLE	: APPLIED MATHEMATICS
TEACHING SCHEME	: TH:03; TU: 01(1TH/TU CREDIT=1CLOCK Hrs.)
TOTAL CREDITS	: 04
TH. TEE EXAM.	: 03 Hrs.
PR. TEE EXAM	: --
PT. EXAM	: 01 Hrs.

❖ RATIONALE:

Mathematics is the backbone of Technical courses, Understanding of engineering concepts require logical approach and thinking. The course is extension of Basic Mathematics of first semester and stepping into the prerequisites to learn Calculus and Numerical method. Applied Mathematics lay down the foundation to understand and express principles and laws involved in other Technological courses.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Apply the concept of functions to Identify and find the value, Range, Domain ,Co Domain of the given function.
2. Apply methods of evaluation of limit to solve the given examples of limits .
3. Apply the concept of limit, define the first principal of derivatives, notation, understood the Rules to solve the examples of derivatives.
4. Using integral of standard function, rules, and methods to solve indefinite and definite integral problems .
5. Apply the concept of differential equation which helps to solve engineering problems.
6. Apply various numerical method to solve algebraic and simultaneous equations.

❖ COURSE DETAILS:

A.THEORY:

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs
1. Functions	1a. Find the Range , Domain and Co-Domain of the given function. 1b. Find the value of given function. 1c. Identify the type of given functions. 1d. Check whether the given function is odd or even function	1.1 Concept of function, Domain, Co-Domain, and Range of the Functions. 1.2 Value of a function. 1.3 Types of functions:- Logarithmic, Inverse, Algebraic, Trigonometric,& Inverse(LIATE) 1.4 Even and odd Function , Parametric, Composite Implicit, Explicit Functions.	04
2. Limits	2a. Evaluate given limits by using Algebra of limits . 2b. Solve the limit of given trigonometric function. 2c. Evaluate limits of the given exponential functions. 2d. Evaluate the given logarithmic limit and Exponential limit.	2.1 Concept of limit. 2.2 Algebra of limits.(Addition Subtraction, Multiplication & Division) 2.3 Limits of algebraic functions (By Direct Method, Factorisation, & Rationalisation Method).Limits of Trigonometric function. Limit based on x tends to infinity, 2.4 Exponential Limits & Logarithmic Limits, Use of Logarithmic Limits for Exponential Limits.	08
3. Derivatives and Higher Order Derivatives	3a. Find the derivatives of given function using standard function formulae. 3b. Find the derivatives of given function using Rules of Derivatives. 3c. Find the derivatives of given composite inverse and inverse trigonometric, implicit, explicit, parametric, and exponential functions. 3d. Differentiate the given function w.r.t. x by using logarithmic differentiation.	3.1 First principle of derivatives and Notations(without proof), Derivatives of standard function.(LIATE) 3.2 Rules for differentiation (without proof) 3.3 Derivative of composite, inverse and inverse trigonometric , implicit, explicit, parametric, and exponential functions. 3.4 Logarithmic differentiation. 3.5 Derivatives of one function with respect to another function 3.6 Second order differentiation.	12

	3e. Differentiate the given function w.r.t. another function. 3f. Find the second order derivatives of the given function.		
4. Indefinite and Definite Integration	4a. Integrate the given function w.r.t. x 4b. Evaluate the given integral by substitution method. 4c. Evaluate the integral of given composite or rational function. 4d. Integrate the given Trigonometric function. 4e. Integrate the given 4f. function by, Integration by Parts or Partial Fraction. 4g. Evaluate the given definite integral by using properties.	4.1 Concept of Integration as a anti derivatives, Integral of standard function (LIATE), Rules of integration. 4.2 Integration by substitution method. 4.3 Integration of Algebraic Rational function and composite function. 4.4 Integration of trigonometric function. 4.5 Integration by partial fraction and by parts. 4.6 Definite integral and their properties.	10
5. Differential Equations	5a. Find the order and degree of the given D.E. 5b. Form the differential equation by eliminating arbitrary constant. 5c. Solve given differential equations of first order and first degree by variable separable method. 5d. Reduce the given differential equation to variable separable form and solve it. 5e. Identify the given D.E(Homogeneous, Linear, or Bernoulli's) and find its solution.	5.1 Concept of differential equation, Order and degree of differential equation, Formation of differential Equation. 5.2 Methods of solving Differential equation of first order and first Degree. (a) Variable separable Method. (b) Equation reducible to variable separable form. (c) Exact Differential Equation. 5.3 Linear differential equation 5.4 Homogenous differential equation, 5.5 Bernoulli differential equations.	06

6. Numerical Methods	6a. Identify the interval of root of algebraic equation and Find the approximate root of algebraic equation by using given method. 6b. Solve the system of simultaneous equations containing 3 unknowns by using given method.	6.1 Solution of algebraic equation by, - Bisection method. - Regula-Falsi method. - Newton-Raphson method. 6.2 Solution of Simultaneous Equations containing 3 unknowns by, - Gauss elimination method. - Iterative methods: Gauss-Seidal & Jacobi's method.	08
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Assignments	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Find value of any given function.	1. Functions	01
2	Find limits algebraic functions.	2. Limits	01
3	Find limits trigonometric, exponential functions.		01
4	Solve examples on derivative using algebraic operations.	3. Derivatives and Higher order Derivatives	01
5	To find dy/dx of implicit functions.		01
6	To find dy/dx of parametric functions and inverse trigonometric functions.		01
7	To find the higher order derivatives of the given function.		01
8	Solve examples using rules of integration and substitution method.	4. Integration, Definite integration	01
9	Solve examples using integration by parts and partial method.		01
10	Solve examples using integration by parts and partial fraction method.		01
11	Solve the examples of Definite integral.(Simple)		01
12	Evaluate definite integral using properties.		01
13	Solve D.E. using variable separable method and reducible to variable separable.	5. Differential Equations	01
14	Solve homogenous, linear and Bernoulli D.E.		01
15	Find the approximate root of algebraic equation.	6. Numerical Methods	01
16	Solve the system of simultaneous equations.		01

❖ SPECIFICATION TABLE FOR THEORY PAPER:

R – Remember

U – Understand

A – Analyze / Apply

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Functions	02(00)	00(03)	03(00)	05(03)
2	Limits	02(00)	06(00)	00(03)	08(03)
3	Derivatives and Higher Order Derivative	02(02)	03(03)	06(03)	11(08)
4	Integration, Definite integration and Applications	02(02)	09(00)	03(06)	14(08)
5	Differential Equations	04(00)	06(03)	00(03)	10(06)
6	Numerical Methods	00(02)	00(06)	12(00)	12(08)
	Total	12(06)	24(15)	24(15)	60(36)

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

T- Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
1	1	R	2	2	R	2	3	R	2	3	R	2	4	R	2	4	R	2	6/9
	5	R	2	5	R	2	6	R	2										
2	1	U	3	2	U	3	2	U	3	1	A	3	2	A	3				3/5
3	3	U	3	3	U	3	4	U	3	4	U	3	3	A	3				3/5
4	4	U	3	4	A	3	5	U	3	4	A	3	4	A	3				3/5
5	5	U	3	5	U	3	6	U	3	6	U	3	5	A	3				3/5
6	3	A	6	6	A	6	6	A	6										2/3

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Who m	Frequency	Max Mark s	Min Mar ks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3, 4,5,6
		Class Room Assignments		Tutorial Assignments	15	--	Assignment Book	1, 2, 3, 4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	60	24	Theory Answer Scripts	1, 2, 3, 4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	--	--	--	--
		Journal Writing		Assignments	--	--	--	--
				Total	--	--		
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	--	--
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course Survey			End of The Course	Questionnaires			

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	1	2	3
1	3	-	-	-	-	-	-	-	-	-
2	3	-	-	-	-	-	-	-	-	-
3	3	-	-	-	-	-	-	-	-	-
4	3	-	-	-	-	-	-	-	-	-
5	3	-	-	-	-	-	-	-	-	-
6	3	-	-	-	-	-	-	-	--	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Engineering Mathematics	P N Wartikar, Pune Vidyarthi Griha Prakashan	4567155742
2	Calculus of One Variable	IA Maron, Publisher: Arihant, 5 th Edition 2015	9352030559
3	Engineering Mathematics	S.S .Shastry, Prentice Hall Of India, 4 th edition 2008	9788120336162
4	Engineering Mathematics	D.T.Gaikwad, S Chand Publication, 1 st edition 2010	8121933560
5	Higher Engineering Mathematics	B S Grewal, Publisher: S Chand, 43 rd edition 2014	9788174091955

❖ **E-REFERENCES:**

- <https://msbte.org.in/msbtelectures.html>

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Mr. S.M.Sayyed	I/C HOD, Mathematics Deptt.	Govt. Polytechnic, Nagpur
2	Mr.P.T.Khobaragade	Lecturer	Govt. Polytechnic, Nagpur
3	Mr.G R.Dewalkar	Lecturer	Govt. Polytechnic, Nagpur
4	Mr.W.T.Gaidhane	Lecturer	Nagar Parishad Jr. College ,Arvi
5	Dr. P.B.Bahatkar	Professor	Y. C. C. E. Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN ME/AE/CE/EE / ET/PK/ MT/TX/IT/CM / MC / AI
COURSE CATEGORY	: BASIC SCIENCE COURSE
COURSE CODE	: CH101G
COURSE TITLE	: CHEMISTRY
TEACHING SCHEME	: TH: 03; TU: 00; PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 04 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs
PT. EXAM	: 01 HR

❖ **RATIONALE:**

Chemistry is the basic science which is essential to all engineering courses. For an engineer, the usage of equipment's and instruments would require knowledge of chemical substances, their composition and properties. This course describes the basic facts, concepts & principles for the understanding of basic elementary knowledge related to all engineering fields. Chemistry subject knowledge also aims to bridge the theoretical concepts and their practical engineering applications, thus highlighting the role of chemistry in the field of engineering. This will be gateway for development of reasoning capacity of students and understanding new technology as well.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Predict the valency and application of catalyst in industry.
2. Select metal and nonmetallic materials for industrial application.
3. Select Engineering materials on the basis of properties and application.
4. Apply knowledge related with Electrochemistry, and fuel Cells.
5. Apply the knowledge of preventive measures in Industry.
6. Analyze different type of energy sources for sustainable development.

❖ **COURSE DETAILS:****A. THEORY:**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs
1. Chemical Bonding & Catalysis	1a. Predict valence electrons and type valence of elements. 1b. Formulate given molecule on the basis of given type. 1c. Differentiate between electrovalent and covalent compound on basis of given properties. 1d. Describe given type of catalysts, catalysis. 1e. Select the relevant catalyst for given application.	1.1 Valency: Definition & types of valence (Electrovalence & Covalence). Octet Rule, Duplet Rule. 1.2 Formation of Electrovalent e.g., NaCl, CaCl ₂ , MgO. and Formation of Covalent Compounds CO ₂ , NH ₃ , N ₂ . 1.3 Distinction between electrovalent & covalent compounds (formation, M.P. B.P., Type of bond, Solubility, strength of bond) Catalysis: 1.4 Definitions of catalyst Types of Catalyst, Positive Catalyst, Negative Catalyst, Auto - catalyst.: Definitions of catalysis, Types of catalysis. 1.5 Industrial Application of Catalyst.	06
2. Metallurgy, Alloy & Polymer	2a. Describe given terms in metallurgy. 2b. Describe given process of metal extraction. 2c. Select proper alloy for given application or vice versa. 2d. Distinguish between thermo softening and thermosetting plastics on given points. 2e. Select the given Plastic Polymer for Industry application. 2f. Apply given Thermal insulators in industry on their Characteristics.	2.1 Metallurgy: Definitions of terms used in metallurgy like Minerals, Ore, gangue, Flux, slag. Definition of metallurgy. 2.2 Flow chart of extraction process (Crushing, Concentration (physical and chemical), reduction, refining. 2.3 Definition of alloy, purposes of alloy formation, Types of alloys (ferrous alloy and nonferrous alloy) Composition properties and application of High-speed steel, Magnetic steel, Duralumin, Woods metal. 2.4 Polymer (plastic): Definition of polymer, types of polymers and difference of thermo softening and thermosetting plastics. 2.5 Formation of Plastic by Addition polymerization of Polyethylene, polystyrene. Formation of Plastic by Condensation process Bakelite plastic, nylon 6, 6. 2.6 Insulating material: Characteristics	08

		of Thermal insulators. Preparation, Properties & Applications of Thermocol & glass wool.	
3. Engineering Materials	3a. Describe functions & characteristics of given Lubricants. 3b. Select given lubricant on the basis of different types of machines. 3c. Detect the adverse effects of hard water as per given industry. 3d. Describe given type of water treatment process. 3e. Describe the given properties and applications of given construction material.	Lubricant: 3.1 Definition, Types of Lubricants, Functions of Lubricants. Characteristics of Lubricants- Viscosity, Volatility, viscosity Index, oiliness, cloud and pour point, Flash and fire point, Neutralization number. 3.2 Selection of Lubricant for various types of machines such as I.C engine, Gear system, cutting tools delicate and simple machines, tractors and rollers. Water: 3.3 Types of impurities in natural water. Definitions of hard and soft water, types of hardness. Adverse effects of hard water in: Industries- paper industry, textile industry, dyeing industry, sugar industry. 3.4 Potable water treatment: Sedimentation, Coagulation, filtration, sterilization (Chlorination method). Cement & Lime 3.4 Portland cement: Definition, chemical composition. Special Cements: Properties and application of water proofing cement, super sulphate cement. lime: Composition, properties and uses of fat lime, lean lime.	10
4. Electrochemistry	4a. Describe given terms involved in electrochemistry. 4b. Interpret degree of ionization on the basis of given factors. 4c. Describe the electroplating of given metal. 4d. Calculate the pH/POH of solutions with given concentration. 4e. Differentiate Primary and Secondary cells on given points. 4f. Use of Hydrogen-	Basic concepts of electrolysis: 4.1 Atoms, Ions, Electrolyte, conductivity of electrolytes, type of electrolyte- strong and weak electrolyte. 4.2 Ionization and electrolytic dissociation, Arrhenius theory of electrolytic dissociation, degree of ionization, factors affecting degree of ionization. Electrolysis 4.3 Faraday's laws of electrolysis: Faraday's First and Second law (Statement and mathematical expression) Application of electrolysis: Electro Plating of	09

	oxygen fuel cell in Engineering field.	copper and silver. pH and pOH: 4.4 Definition of pH, pOH, pH scale, numerical. Electrochemical cells/ batteries: 4.5 Basic concepts: cell, battery, distinction between Primary and secondary cells. 4.6 Fuel cell: Definition, construction, working, advantages, limitations and applications of Hydrogen-oxygen fuel cell.	
5. Corrosion	5a. Identify the given types of oxide film & its effect on corrosion. 5b. Describe mechanism of given type of corrosion. 5c. Choose different corrosion protection methods of metal and its use in given situation.	5.1 Definition of corrosion, Types of corrosion, mechanism of Atmospheric or chemical corrosion. Effect of oxide film on atmospheric corrosion. Factor effecting atmospheric corrosion. 5.2 Immersed Corrosion or Electrochemical Corrosion, definition, types and mechanism (Hydrogen evolution and oxygen absorption) 5.3 Application of Protective Coatings like metal coating by - Galvanizing, Tinning, Sherardizing, Metal Spraying, Metal Cladding	07
6. Energy & Pollution Control	6a. Compare given types of Fuel on given points. 6b. Analyse components of fuel by proximate analysis. 6c. Describe the properties and uses of given solid, liquid and gaseous fuel. 6d. Select proper pollution control methods for given type of pollution. 6e. Describe the significance of given E- waste Management methods for implementation of sustainable development.	Energy 6.1 Definitions of a fuel, Classification of fuels with suitable examples Characteristics of a good fuel, calorific value and ignition temperature, comparison between solid, liquid, gaseous fuels based on their properties. Classifications of fuel: 6.2 Solid fuels: analysis of solid fuels- Proximate analysis for determination of moisture, volatile matter, ash and fixed carbon, significance of Proximate analysis. 6.3 Liquid fuels: Bio diesel - properties, applications. Gaseous fuels: Composition, properties, applications of LPG, CNG Pollution control 6.4 Definition of pollution – Types of pollution (Air, water pollution) 6.5 3R Concept, recycling of plastic. E -waste management, sustainable development – significance of Wind	08

		Energy, Solar Energy.	
		Total Hrs.	48

B. LIST OF PRACTICALS / LABORATORY EXPERIENCES / ASSIGNMENTS:

Pra cti- cals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Explore the chemistry laboratory.	Chemical Bonding & Catalysis	02
2	Analyse basic and Acidic Radicals of known salt solution-1 (Confirmatory Test) using qualitative analysis method.	Chemical Bonding & Catalysis	02
3	Analyse basic and Acidic Radicals of known salt solution-2 (Confirmatory Test) using qualitative analysis method.		02
4	Analyse basic and Acidic Radicals of known salt solution-3 (Confirmatory Test) using qualitative analysis method.		02
5	Determine the percentage of Iron in given steel sample by redox titration. (OR) Determine the percentage of copper in given alloy sample.	Metallurgy Alloys & Polymer	02
6	Prepare Phenol formaldehyde resin used in manufacturing of Bakelite Plastic.	Metallurgy Alloys & Polymer	02
7	Determine total hardness (permanent and temporary) of given sample of water by EDTA method.	Engineering Materials	04
8	Determine the percentage of calcium content in cement	Engineering Materials	02
9	Determine acid value of lubricant by KOH OR Determine coefficient of viscosity using Ostwald's Viscometer.	Engineering Materials	02
10	Determination of PH value of given solution by using PH meter.	Electrochemistry	02
11	Find the Electrochemical equivalent (ECE) of copper.	Electrochemistry	02
12	Find the relation between loss in weight of aluminium strip in acidic and alkaline medium and rate of corrosion	Corrosion	02
13	Determine the strength of given hydrochloric acid solution by titrating it against sodium hydroxide solution.		02

14	Determine the percentage of moisture and ash content in the given coal sample. by proximate analysis.	Energy & pollution control	04
		Total	32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Chemical Bonding & Catalysis	02(02)	03(03)	03(00)	08(05)
2	Metallurgy, Alloy & Polymer	04(00)	06(00)	00(06)	10(06)
3	Engineering Materials	00(02)	06(06)	06(00)	12(08)
4	Electrochemistry	02(00)	03(06)	06(00)	11(06)
5	Corrosion	02(02)	03(00)	03(03)	08(05)
6	Energy and Pollution control	02(00)	03(06)	06(00)	11(06)
	Total	12(06)	24(21)	24(09)	60(36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

T-Unit/Topic Number

L- Level of Question

M-Marks

R-Remember

U-Understand

A-Analyze/ Apply

1R2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Options
1	1	R	2	2	R	2	2	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	3	R	2	5	R	2										
2	1	U	3	1	A	3	2	U	3	1	U	3	5	A	3				3/5
3	2	U	3	3	U	3	3	U	3	3	U	3	3	U	3				3/5
4	4	U	3	5	U	3	5	A	3	4	U	3	4	U	3				3/5
5	6	U	3	6	A	3	6	A	3	6	U	3	6	U	3				3/5
6	3	A	6	4	A	6	2	A	6										2/3

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Cours e Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3, 4, 5, 6
		Class Room Assignments		Assignments	15	--	Assignment book	1, 2, 3, 4, 5, 6
	TEE (Term End Examination)	End Exam	Students	End of the Course	60	24	Theory Answer Scripts	1, 2, 3, 4, 5, 6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous assessment of practical	Students	End of every practical	20	--	Journal	1, 2, 3, 4, 5, 6
		Journal Writing		Assignment	05	--	Journal	1, 2, 3, 4, 5, 6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End of the Course	50	20	Practical Answer Scripts	1, 2, 3, 4, 5, 6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4, 5, 6
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Writing chemical reactions, handling the equipment, writing procedure etc.	10
2	Performance	20
3	Calculation, Result, Drawing Graphs (if any)	10
4	Viva Voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	1	2	3
1	3									
2	3			3						
3	3			3	3		3			
4	3			3			3			
5	3				3		3			
6	3			3	3		3			

- 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Engineering Chemistry Jain and Jain	Engineering Chemistry Jain and Jain, Dhanpat Rai publishing company(P) ltd.15 edition	10092
2	Engineering Chemistry	Engineering Chemistry S. S. Dara, S. Chand Publication	15 th Edition
3	Engineering Chemistry	R. Sivakumar N. Sivakumar and Tata McGrawHill, edition10.	9780745-328896
4	Polytechnic Chemistry	Vedprakash Mehta, Jain brothers, 6 th Edition	13-9788183600134
5	Industrial Chemistry	Goel Publication, 8 th Edition	81877224002

❖ **E-REFERENCES:**

- http://www.substech.com/dokuwiki/doku.php?id=full_index_of_articles_on_polymer_s- , accessed on 10 June 2021
- http://www.substech.com/dokuwiki/doku.php?id=full_index_of_articles_on_fluids-, accessed on 10 June 2021
- <http://www.asetute.com.au/corrosion.html>, accessed on 10 June 2021
- http://www.sherardizing.com/resources/files/9_Sherardizing_Corrosion.pdf , accessed on 10 June 2021
- <http://www.galvanizeit.org/aga/animation> , accessed on 10 June 2021
- http://www.ehow.com/list_6725219_different-types-metal-cladding.html , accessed on 10 June 2021

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

1. Electronic balance (measure up to 0.001 mg)
2. Battery 12 volt
3. Digital multi-meter
4. Rheostat assorted sizes
5. Voltmeter MI 0-150-300 V
6. Ammeter MI 0-5-10 A
7. Electrolytic cell set up
8. Digital PH meter

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM : (786)**

Sr.No.	Name	Designation	Institute / Industry
1	Dr.M.I.Ahmed	Coordinator Sr. Lecturer in Chemistry	Government Polytechnic, Nagpur
2	Dr.S.A.Petkar	Lecturer Chemistry.	Government Polytechnic, Nagpur.
3	Dr.K.A.Nandekar	Lecturer Chemistry	G.H.Raisoni college of Engineering Nagpur
4	Dr.Prashant Zade	Lecturer Chemistry	Dharampeth Polytechnic, Nagpur
5	Prashant B.Chouke	Lecturer Chemistry	Government Polytechnic, Brahmpuri
6	Dr.D.K.Borikar	Lecturer Chemistry	Government Polytechnic, Nagpur
7	Dr.S.L.Sayre	Lecturer Chemistry	Government Polytechnic, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : DIPLOMA IN COMPUTER ENGINEERING /
INFORMATION TECHNOLOGY /AIML
COURSE CATEGORY: ENGINEERING SCIENCE COURSE
COURSE CODE : EC104G
COURSE TITLE : PRINCIPLES OF ELECTRONICS
TEACHING SCHEME: TH: 03; TU: 00; PR: 02(CLOCK HRs.)
TOTAL CREDITS : 04(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCKHR.)
TH. TEE EXAM : 03 HRs
PR. TEE EXAM : 02 HRs
PT. EXAM : 01 HR

❖ RATIONALE:

Computer engineering and Information Technology students deals with basics of materials and semiconductor components used in electronic circuits and computer systems. This course describes the construction, characteristics, operating principle and applications of electronic devices. It is very useful course for understanding working and applications of some basic electronic circuits

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Describe the working of given electronic component.
2. Plot V-I characteristics of given diode.
3. Develop rectifier and filter circuits.
4. Use transistor as amplifier and switch.
5. Analyze given voltage regulator circuit.
6. Construct oscillator circuit for required frequency output signal.

❖ **COURSE DETAILS:****A. THEORY:**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. Materials, Components and Circuit Elements	1a. Define active and passive components. 1b. Describe construction and functions of given component. 1c. Identify different resistors, capacitors, inductors, relay, switches, connectors and cables. 1d. Estimate the value of resistor using color coding. 1e. Describe the concept of relay, cables, switches, connectors. 1f. List specifications and applications of different components.	1.1 Definition of Active and Passive components with examples 1.2 Types of passive components:- Resistors (fixed resistor, wire wound resistor and LDR), Classification, functions, specifications, color coding, symbols, unit and applications. Capacitor Classification, functions, specifications, unit and applications. Inductor Classification, functions, specifications, symbol, unit and applications. 1.3 Concept of Relays, specifications, functions and application of relays 1.4 Concept of Switches, specifications functions and applications of switches 1.5 Concept of connectors, specifications functions and applications of connector 1.6 Concept of cables, specifications functions and applications of cables	10
2. Semiconductor Theory and Diodes	2a. State and define different types of semiconductors. 2b. Describe the effect of temperature on conductivity of semiconductor. 2c. Describe crystalline structure of given type of semiconductor. 2d. Describe formation of p-n junction semiconductor. 2e. Plot V-I characteristic of PN junction diode. 2f. Describe working of	Semiconductor theory: 2.1 Definition of semiconductor, Intrinsic Semiconductor and Extrinsic Semiconductor with examples 2.2 Commonly used semiconductors: Germanium, Silicon. 2.3 Effect of temperature on its conductivity on intrinsic semiconductor. 2.4 Types of extrinsic semiconductors: P-type and N-type Pentavalent Impurities, Trivalent Impurities, majority and minority carriers, crystalline structure and conduction in P-type and N-	09

	given diode. 2g. Select diode as per application.	type semiconductor Semiconductor Diodes. 2.5 Formation of P-N junction 2.6 Forward and Reverse biasing V-I characteristics of PN junction diode 2.7 Types of reverse breakdown: Zener and avalanche breakdown, symbol, working and applications of various P N junction diodes: Zener diode, LED, LASER and Photodiode.	
3. Rectifiers and Filter Circuits	3a. Define rectifier and filters. 3b. State the need of rectifiers and filters. 3c. Describe circuit diagram and operation of given rectifier circuits. 3d. Distinguish between given rectifier circuits. 3e. Describe circuit diagram and operation of CLC Filter. 3f. Develop given rectifier and filter circuit and draw input and output waveforms.	Rectifiers 3.1 Definition and types of rectifiers 3.2 Circuit diagram, working, output waveforms, advantages, disadvantages, specifications of half wave rectifiers (HWR), Center-tapped full wave rectifier and Bridge rectifier 3.3 Comparisons of half wave rectifiers (HWR), Center-tapped full wave rectifier and Bridge rectifier 3.4 Definitions of peak inverse voltage, ripple factor, rectification efficiency. Filters 3.5 Necessity and types of filters. 3.6 Circuit diagram, working, output waveforms, advantages, disadvantages of CLC filter	07
4. Bipolar Junction Transistor (BJT)	4a. Describe the constructional details and operating principle of Transistor. 4b. Draw circuit diagram of given type of transistor configuration. 4c. Plot input and output characteristics of CE transistor configuration. 4d. Describe the operating regions of transistor.	4.1 Definition of Transistor, NPN and PNP BJT: symbols, constructions, operating principle 4.2 Circuit diagram of CB, CE and CC transistor configuration 4.3 Input and output characteristic of CE configuration 4.4 Operating Regions of BJT. 4.5 Definitions of parameters:- input resistance, output resistance, current gains (alpha and beta) and their relationship, leakage current 4.6 Application of transistor:- transistor as an switch and transistor as an amplifier	09

	4e. Define different parameters of transistors. 4f. Use transistor as a switch and amplifier. 4g. Describe the need of transistor biasing and stabilization. 4h. Describe the conditions for faithful amplification. 4i. Describe the terms related to transistor biasing.	4.7 Definition of faithful amplification, Transistor biasing and stabilization 4.8 Conditions for faithful amplification. 4.9 Concepts of D.C. load line, Operating points	
5. Voltage Regulators	5a. Describe the block diagram of unregulated and regulated power supply. 5b. Illustrate the need of regulation. 5c. Plot the load and line regulation of given voltage regulator circuit. 5d. Demonstrate Zener diode as a voltage regulator. 5e. Analyze given voltage regulator circuit. 5f. Describe the concept of switched mode power supply (SMPS).	5.1 Definition of voltage regulation, Block diagram, working and demerits of unregulated power supply (URPS) 5.2 Necessity and types of voltage regulation 5.3 Definition of load and line regulation 5.4 Zener diode as voltage Regulator and its merits and demerits 5.5 Circuit diagram, working, merits, demerits, of series and shunt regulators using BJT 5.6 Concept of switched mode power supply (SMPS).	05
6. Oscillators	6a. Compare different types of feedback with block diagram. 6b. Describe the effects and advantages of negative feedback in amplifier 6c. Describe the working of LC tank circuit. 6d. State the Barkhausen criteria for sustained oscillation. 6e. Develop oscillator circuit for required	Feedback circuits 6.1 Definition, types, and comparison of feedbacks, Block diagram of positive feedback and negative feedback 6.2 Effects and advantages of negative feedback in amplifier Oscillators 6.3 LC tank circuit, meaning of damped and undamped oscillation. 6.4 Barkhausen criteria for sustained oscillation. 6.5 Circuit diagram, working, advantages, disadvantages and	08

	output frequency signal.	applications of Hartley oscillator, RC phase shift oscillator and crystal oscillator.	
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practical	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Measure Values of resistors using color codes and multimeter.	1. Materials, components, and circuit elements	02
2	Identify various controls of electronics equipment (Digital Multimeter, CRO, Function Generator).		04
3	Plot V-I characteristics of P-N Junction Diode.	2. Semiconductor Theory and Semiconductor Diodes	02
4	Plot V-I characteristics of Zener Diode and Find Zener breakdown voltage.		02
5	Observe and draw the input and output waveforms of Half-wave rectifier with and without CLC filter.	3. Rectifiers and Filter circuits	04
6	Observe and draw the input and output waveforms of Bridge rectifier with and without CLC filter.		04
7	Plot the input and output characteristics of BJT in CE mode.	4. Bipolar junction transistor	04
8	Assemble and analyze the circuit of Zener diode as a voltage regulator.	5. Voltage regulators	04
9	Connect input to SMPS and measure output.		02
10	Construct Hatley oscillator and find output Frequency.	6. Oscillators	02
11	Construct R.C Phase shift oscillator and find output frequency.		02
Total Hrs			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Materials, components and circuit elements	02(00)	06(03)	00(00)	08(03)
2	Semiconductor Theory and Semiconductor Diodes	02(02)	06(03)	00(03)	08(08)
3	Rectifiers and Filter Circuits	02(00)	03(03)	06(03)	11(06)
4	Bipolar Junction Transistor	02(02)	06(03)	06(00)	14(05)
5	Voltage Regulators	02(02)	06(03)	00(03)	08(08)
6	Oscillators	02(00)	03(03)	06(03)	11(06)
	Total	12(06)	30(18)	18(12)	60(36)

R–Remember U–Understand A – Analyze /Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
1	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	2	R	2	4	R	2	5	R	2										
2	1	U	3	1	U	3	3	U	3	1	U	3	3	U	3				3/5
3	2	U	3	2	U	3	5	U	3	2	U	3	5	U	3				3/5
4	4	U	3	4	U	3	6	U	3	4	U	3	6	U	3				3/5
5	5	U	3	2	A	3	3	A	3	5	A	3	6	A	3				3/5
6	3	A	6	4	A	6	6	A	6										2/3

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Sheets	1,2,3, 4,5,6
		Assignments		Continuous	15	--	Assignment Book / Sheet	1,2,3, 4,5,6
	TEE	End Exam	Students	End of the Course	60	24	Theory Answer Sheets	1,2,3, 4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Rubrics &Assessment Sheets	1,2,3, 4,5,6
		Journal Writing		Continuous	05	--	Journal	1,2,3, 4,5,6
				Total	25	10		
	TEE (Term End)	End Exam	Students	End Of the Course	25	10	Rubrics &Practical Answer Sheets	1,2,3, 4,5,6
Indirect	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Drawing circuit diagram, writing observation table, draw waveforms and writing procedure etc.	10
2	Performance of the practical	20
3	Taking observations, Calculation, Result, Drawing Graphs (if any)	10
4	Viva voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes	Program Outcomes (POs)										PSO	
	1	2	3	4	5	6	7	8	9	10	1	2
1	3	-	-	-	-	-	-	-	-	-	-	-
2	3	-	-	-	-	-	-	-	-	-	-	-
3	3	3	3	-	-	-	-	-	-	-	-	-
4	3	3	-	3	-	1	-	-	-	-	-	-
5	3	3	-	3	-	-	-	-	-	-	-	-
6	3	3	3	3	-	-	-	-	-	-	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXTBOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Principles of Electronics	V. K. Mehta, S. Chand & Company Ltd., Reprint, 1996	8121910536
2	Applied Electronics	R S. Sedha, S. Chand & Company Ltd. 2005	8121927838
3	Basic Electronics	Grob, Tata McGraw Hill	9780070634329
4	Electronics Devices and circuits	S. Salivahanan, Tata McGraw Hill	9780070660496
5	Electronic Principles	Albert Malvino & David J Bates, Tata McGraw Hill	9780070634244

❖ **E-REFERENCES:**

- www.nptel.ac.in accessed on 13th July 2021
- <http://vlabs.iitkgp.ac.in/be/> accessed on 13th July 2021
- <https://www.learnelectronicsonline.com/> accessed on 13th July 2021

- <http://www.instructables.com/id/Basic-Electronics> accessed on 13th July 2021
- <https://learnabout-electronics.org/> accessed on 13th July 2021
- <http://www.datasheetcafe.com/> accessed on 13th July 2021

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

1. Ammeter MI 0-5-10A
2. Voltmeter MI 0-150-300V
3. Regulated Power Supply
4. Digital Multi-meter
5. Cathode Ray Oscilloscope (0-50MHZ)
6. Function Generator

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr.R.V.Yenkar	Head of Electronics & Telecomm Engineering	Government Polytechnic, Nagpur.
2	Dr.V.H. Mankar	Head of Electronics & Telecomm Engineering	Government Polytechnic, Nagpur.
3	Prof.N.V.Chide	Lecturer in Electronics & Telecomm Engineering	Government Polytechnic, Nagpur.
4	Dr. M. N. Bawane	Lecturer in Electronics & Telecomm Engineering	Government Polytechnic, Nagpur.
5	Mr.Sandip V. Darwhekar	Director	Beta Computronics Pvt. Ltd. Nagpur
6	Mrs. Gazala Ali	HOD, Electronics	Anjuman Polytechnic, Nagpur.
7	Mr. Kapil Pachpor	Lecturer in Electronics & Telecomm Engineering	Government Polytechnic, Amravati.

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN INFORMATION TECHNOLOGY/AIML/ COMPUTER ENGINEERING
COURSE CATEGORY	: ENGINEERING SCIENCE COURSE
COURSE CODE	: IT101G
COURSE TITLE	: BASICS OF PROGRAMMING
TEACHING SCHEME	: TH: 03; TU: 00; PR: 04(CLOCK Rs.)
TOTAL CREDITS	: 05 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs
PT. EXAM	: 01 HR

❖ **RATIONALE:**

Engineering students should know the basics of programming in open source environment. This course describes the basics of problem solving and logic development. It also describes basics of programming using C programming language. C is the most commonly used structured programming language. It is very useful course for understanding the higher level knowledge in the field of software engineering and foundation course for learning advanced object oriented languages.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Design algorithm and draw flowchart by using the basic entities of c language.
2. Use proper format specifiers and operators while designing the programs.
3. Write the program using appropriate branching and looping statements.
4. Apply modular programming by choosing correct type of function while writing the programs.
5. Develop programs that perform operations using arrays, strings and pointers.
6. Design the real world application using user defined data type.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. Fundamentals of Programming	1a. Use variable and constant in the given program and correct invalid variable names. 1b. Compare high level language and low level language. 1c. Write an algorithm and draw flowchart for the given problem. 1d. Draw structure of C program. 1e. Develop the given C program to show process of creating, compiling and executing a program.	1.1 History of C, constants, Definition / description of program, syntax rules, character set, C tokens, keywords, identifiers, rules for identifiers, constants, types of constants, backslash character constants, variables, data types, primary, derived, user defined data types, size and range of data types, declaration and initialization of variables, defining symbolic constants, underflow and overflow of data. 1.2 Definition / description of algorithm, flowchart, High level language, Low level language, compiler, interpreter. 1.3 Flowchart symbols, algorithm and flowchart for simple problems 1.4 Structure of C program, various sections of C program and their purpose. 1.5 Process of creating, compiling and executing program, Develop sample programs based on above concepts.	04
2. Basic I/O, Operators and Expressions in C	2a. Write valid syntax for given Formatted and unformatted I/O functions of C language. 2b. Write valid C expressions using various operators. 2c. Identify and correct the errors in expressions and statements. 2d. Arrange the operators with respect to their precedence and associativity. 2e. Use format specifiers and operators to write given C programs.	2.1 Syntax, use, examples of scanf(), printf(), getchar(), putchar(), gets(), puts() and examples, various format codes (%c, %d, %e, %f, %g, %h, %i, %o, %s, %u, %x), output format flags (-, +, 0, #), Rules for scanf(). 2.2 Definition and example of operands, operators, expression, Symbols, uses and examples of various Arithmetic, Relational, logical, boolean, bitwise, assignment, ternary, increment (++) and decrement (--) operators, rules for ++, -- operators supported by C. 2.3 Writing and evaluation of arithmetic expression. Precedence of arithmetic operators, rules for evaluation of expression, inbuilt math functions: sin(), cos(), tan(), sqrt(), pow(), log(), log10(), exp().	06

		2.4 Type casting: Implicit and Explicit, Precedence and associativity of operators, their rules. 2.5 Simple C programs using various operators and typecasting.	
3. Decision Making, Branching and Looping	3a. Write Decision making statements with valid syntax supported by C. 3b. Select and apply appropriate Decision making statements, loop statements supported by C for given problem. 3c. Compare break and continue statement. 3d. Write given program using break , continue and exit() statment. 3e. Write given C programs using decision making and loop statements.	3.1 Syntax, working, flowchart and 3.2 example of if , if- else, nested if- else , 3.3 else- if ladder, switch statement, rules for switch statement, goto statement (forward jump and backward jump). 3.4 Syntax, working, flowchart, comparison and example of for loop, while loop and do while loop. Jumping within loops and jumping out of loop. 3.5 Syntax , working and use of break, continue and exit(); 3.6 Algorithm, flowchart programs using if , if- else, nested if- else , else-if ladder, switch statement, goto , for loop , while loop, do - while loop, nested loops .	10
4. Functions	4a. Use actual and formal parameter in given c program. 4b. Apply given terms Related to function in given program. 4c. Compare between different categories of function. 4d. Write given program using pass by value and pass by reference. 4e. Develop given c programs using recursion.	4.1 Definition / description of modular programming, User Defined Function (UDF), function prototype, local, global parameters and formal, actual arguments, Library and user defined functions. 4.2 Elements of UDF, definition of UDF, return values and their types, function call, function declaration 4.3 Function categories: function with no argument and no return value, with no argument but return value, with argument and no return value, with no argument and one return value, that returns multiple values. 4.4 Pass by value and by reference, rules for pass by pointers. 4.5 Algorithm, flowchart and programs based on functions, call by value call by reference, recursion.	08

5. Array and Pointers	5a. Find the size of given array and string. 5b. Identify and debug the errors while declaring or initializing the array and string. 5c. Use various input/output string functions depending upon the given problem. 5d. Develop the program using given string functions. 5e. Write pointer variable and perform given arithmetic operations on pointer variables. 5f. Compare array and pointer. 5g. Write given program using arrays, strings and pointers.	5.1 Definition of subscript, subscripted variable, derived data type, array, character array, string, NULL character, pointer 5.2 Declaration, compile time and run time initialization, accessing and processing elements of one dimensional array, 2D array. 5.3 Declaration, initialization of character array, using getchar(), gets(), scanf(), putchar(), puts(), printf() to input /output strings, Arithmetic operations on characters. 5.4 Syntax, working, use and examples of string handling functions like strlen(), strcpy(), strcmp(), strcat(). 5.5 Symbol and use of indirection operator, address operator. Initialization of pointer variable, legal arithmetic on pointers, comparison of Array and Pointer. 5.6 Benefits / advantages of using arrays, strings and pointers. 5.7 Programs based on arrays for sorting and searching, strings, Pointers, Pointers and arrays.	10
6. Structure and Union	6a. Write the valid syntax to define given structure, union, enum and class. 6b. Compare Structure and Union. 6c. Use nesting of structure in the given Program. 6d. Write the correct syntax for declaration of given array or Structure. 6e. Design real life application using structure for given Problem statement.	6.1 Description of user defined data type, Structure and Union variables, member operator, ENUM, Class. 6.2 Structure definition, declaration and initialization. Accessing, copying, comparing structure members, size of structure, rules for initialization of structure, comparing structure and union. 6.3 Examples of array of structures, array within structure and structure within structure. 6.4 Benefits / advantages of using Structures, Comparison of array and structure. 6.5 Programs based on Structure, Union, array of Structures, array within structure and structure within structure .	10
Total Hrs.			48

B. LIST OF PRACTICALS / LABORATORY EXPERIENCES / ASSIGNMENTS:

Practical	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Install C and other compilers.	1. Fundamentals of programming	02
2	i) Develop and execute two C programs using standard formatted I/O functions. ii) Develop and execute four C programs using various operators and typecasting.	2. Basic I/O , Operators and Expressions in C	04
3	Develop and execute two programs each using if - else, if - else if ladder.	3. Decision Making and Branching and Looping	02
4	Develop and execute two programs each using nested if- else and switch statement.		02
5	Develop and execute two programs using while Loop.		02
6	Develop and execute two programs using do-while loop.		02
7	Develop and execute two programs each using for loop and nested for loop.		04
8	Develop and execute 2 programs using function based on parameters passing by value.	4. Functions	02
9	Develop and execute 2 programs using function based on parameters passing by reference.		04
10	Develop and execute a programs using function based on recursion.		02
11	Develop and execute two programs each using 1D and 2D arrays.	5. Array and pointers	06
12	Develop and execute a program using character array.		04
13	Develop and execute two programs each using string library functions.		02
14	Develop and execute two programs each using pointers.		04
15	Develop and execute a program using array of pointers.		02
16	Develop and execute a program each using structure and union.	6. Structure and Union	02
17	Develop and execute two programs using array of structures and array within structure.		04
18	Develop and execute a program using structure within structure.		02
19	Develop and execute a program using class.		02
20	Design the project based on function , structure and other concepts of C language.		10
Total Hrs			64

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Fundamentals of programming	02(02)	06(03)	00(00)	08(05)
2	Basic I/O , Operators and Expressions in C	02(02)	03(03)	03(00)	08(05)
3	Decision Making, Branching and Looping	02(00)	03(00)	06(06)	11(06)
4	Functions	02(02)	03(03)	06(03)	11(08)
5	Arrays and Pointers	02(00)	03(00)	06(06)	11(06)
6	Structures and Unions	02(00)	00(03)	09(03)	11(06)
	Total	12(06)	18(12)	30(18)	60(36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER

T- Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
1	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	2	R	2	4	R	2										
2	1	U	3	2	U	3	3	U	3	1	U	3	2	U	3				3/5
3	1	U	3	4	U	3	5	U	3	4	U	3	6	U	3				3/5
4	2	A	3	3	A	3	4	A	3	3	A	3	4	A	3				3/5
5	3	A	3	4	A	3	6	A	3	3	A	3	6	A	3				3/5
6	5	A	6	6	A	6	5	A	6										2/3

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Who m	Frequency	Max Mark s	Min Mark s	Evidence Collected	Course Outcome s
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	15	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	60	24	Theory Answer Scripts	1,2,3,4,5, 6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End of the Course	25	10	Practical Answer Scripts	1,2,3,4,5, 6
Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Writing program and Drawing flow chart	10
2	Execution of program	20
3	Viva voce	20
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES FOR IT DEPT :**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	1	2	
1	3	1	3	3	--	--	--	--	3	
2	3	--	--	3	--	--	--	--	3	
3	3	--	3	3	--	--	--	--	3	
4	3	--	3	3	--	--	--	--	3	
5	3	--	3	3	--	--	--	--	3	
6	3	--	3	3	1	1	1	--	3	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES FOR CM DEPT:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	1	2	
1	3	1	3	3	--	--	--	3	--	
2	3	--	--	3	--	--	--	3	--	
3	3	--	3	3	--	--	--	3	--	
4	3	--	3	3	--	--	--	3	--	
5	3	--	3	3	--	--	--	3	--	
6	3	--	3	3	1	1	1	3	--	

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Programming in ANSI 'C'	E. Balagurusamy , Publication Mc graw Hill Education , 6th Edition	13, 9781259004612
2	Let us C	Yashwant Kanetkar BPB Publication , 13th Edition	13, 9788183331630
3	Complete Reference to C	Herbert Schildt, Publication Mc graw Hill Education , 4th Edition	13 , 9780070411838
4	C Programming Language	Brian W. Kernighan, Dennis M. Ritchie, Publication Pearson , 2 nd Edition	9789332549449
5	C Projects	Yashwant Kanetkar BPB Publication , 4th Edition	978-8170292562
6	Exploring C	Yashwant Kanetkar BPB Publication , 3rd Edition	978-8176566339

❖ **E-REFERENCES:**

- https://onlinecourses.nptel.ac.in/noc19_cs42/preview, accessed on 21st June 2021
- <https://www.youtube.com/watch?v=0-9mRy5iNug> accessed on 21st June 2021
- <https://www.sanfoundry.com/c-interview-questions-answers/> accessed on 21st June 2021
- <https://phy.ntnu.edu.tw/~cchen/ctutor.pdf> accessed on 21st June 2021

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

1. Computer (Dual Core or above)
2. Network printer.
3. TC/GCC compiler

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr. A.R.Mahajan	Head of Department (I.T.Dept.)	Chairman
2	Dr. M.V. Sarode	Head of Department (C.M.Dept.)	Chairman
3	Mr. Dipak Dhote	Operations Manager, IT-Network Infosystems Pvt LTD	Industry Expert
4	Dr. Rakesh Kadu	Assistant Professor, I.T., Ramdeobaba College of Engg, and Management, Nagpur.	Member from Academics(External)
5	Mrs.V.A.Raje	Lecturer in C.O., G.P.Arvi	MSBTE Nominee
6	Mr. L.D.Vilhekar	Lecturer in Information Tech.	Member (Internal), Course Expert
7	Mrs.D.P.Chanmanwar	Lecturer in Information Tech.	Member (Internal)
8	Mr. M.N.Gawande	Lecturer in Electrical Engg.	CDC In Charge and Member Secretary
9	Mr.S.A.Khatri	Lecturer in Computer Engg.	Course Expert , Reviewer

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CE/ME/EE/EC/CM/IT/PK/MT/TX/ TR/MC/AI
COURSE CATEGORY	: ENGINEERING SCIENCE COURSE
COURSE CODE	: IT151G
COURSE TITLE	: INTRODUCTION TO IT SYSTEMS
TEACHING SCHEME	: ONLINE COURSE FOR CREDIT TRANSFER
TOTAL CREDITS	: 02(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: --
PR. TEE EXAM	: --
PT. EXAM	: --

❖ **RATIONALE:**

Information Technology (IT) is an essential tool that we cannot avoid as it plays an important role in our day to day life, especially in the present scenario. Introduction to IT Systems course starts with the basic computer skills, learning basic application software tools, Understanding Computer Hardware, Basic Internet awareness.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Apply the basics of computer fundamentals.
2. Identify Basic Internet skills.
3. Demonstrate the use of different Office Tools.
4. Recognize various computer hardware components.
5. Install, configure and maintain the operating system.
6. Identify and illustrate the use of Digital India portals (state and national portals).

❖ COURSE DETAILS:

Students Can select any ONE from Online Course from A), B) , C) given below. A student must obtain a certificate for passing the examination of selected course.

A) Spoken Tutorial (IIT Mumbai) :-

Module I –Introduction to Computer -- Duration 5 Hrs

Module II - Any two course modules from following

- a) LibreOffice –Writer--10 hours
- b) LibreOffice –Calc -- 12 hours
- c) LibreOffice-Impress --08 hours

Students can register for the above online course modules on Spoken Tutorial Portal in first semester. However institute registration shall be done as per program structure. Program department shall appoint one faculty as mentor to this on line activity.

B) Swayam :-Course Module:- Course in Information Technology—08 Weeks duration

C) Any equivalent course as compared to above from MOOCs available .

❖ SPECIFICATION TABLE FOR THEORY PAPER:Nil**❖ QUESTION PAPER PROFILE FOR THEORY PAPER:Nil**

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	--	--	--	--
		Class Room Assignments		Assignments	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	--	--
				Total	--	--	--	--
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End of the Course	25	10	Practical Answer Scripts	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:** Online Examination❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:IT Dept.**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	3	--	--	--	--	3	3	--
2	3	3		--	--	--	3	3	--
3	3	3	3	3	--	--	3	3	--
4	3	3	--	3	--	--	3	3	--
5	3	3	--	3	--	--	3	3	--
6	3	3	--	--	--	--	3	3	--

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Computer Fundamentals	R.S. Salaria Khanna Publishing House	ISBN: 9789381068533
2	Computer Course Made Easy	Ramesh Bangia Edition: 1	ISBN 13: 9789382609377
3	Internet Applications	Ikvinderpal Singh	ISBN 10: 9381068399

❖ **E-REFERENCES:**

- <https://www.latex-tutorial.com/tutorials/> accessed on 22/6/2021
- <http://www1.maths.leeds.ac.uk/LaTeX/TableHelp1.pdf> accessed on 22/6/2021
- <https://www.wikihow.com/Create-a-Website-Using-Google-Sites> accessed on 22/6/2021
- <http://www.tutorialsforopenoffice.org/> accessed on 22/6/2021

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

1. Computer System (with latest specifications)
2. MS Office 2007 Professional or latest version
3. PC tools
4. Windows 7

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr.A.R.Mahajan	HoD, Information Technology	Government Polytechnic, Nagpur.
2	Mr. Dipak Dhote	Operations Manager, IT- Network Infosystems Pvt LTD	Industry Expert
3	Dr. Rakesh Kadu	Assistant Professor, I.T., Ramdeobaba College of Engg, and Management, Nagpur.	Member from Academics(External)
4	Mrs.V.A.Raje	Lecturer in C.O., G.P.Arvi	MSBTE Nominee
5	Mr. M.N.Gawande	Lecturer in Electrical Engg.	CDC In Charge
6	Mrs.D.P.Chanmanwar	Lecturer in IT	Member (Internal)
7	Mr.L.D.Vilhekar	Lecturer in IT	Member (Internal), Course Expert
8	Mr. S.J.Pukale	Lecturer in IT	Course Expert

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN AI,MC,CE,ME,EE,EC,PK,MT, IT,AU,CM,TX,TR
COURSE CATEGORY	: HUMANITIES & SOCIAL SCIENCE COURSE
COURSE CODE	: EN151G
COURSE TITLE	: BUSINESS COMMUNICATION
TEACHING SCHEME	: TH: 01 TU: 00; PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 02(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: --
PR. TEE EXAM	: 02 HRs
PT. EXAM	: --

❖ RATIONALE:

In this current dynamically evolving scenario, competence in communication skills is one of the requirements of industry from technical students. A diploma holder is expected to interact effectively and efficiently with his peers, superiors, subordinates and clients. Business Communication will prepare him to take on the task of effective communication with ease.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Exhibit appropriate communication skills as required
2. Converse skillfully using modes of communication
3. Prepare and present business communication formats effectively
4. Perform coordinated activities within and outside organization
5. Draft business correspondence with minimal errors

❖ **COURSE DETAILS:****A. THEORY:**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs
1. Communication	1a. Apply modern concept of communication. 1b. Identify & Overcome barriers to communicate effectively. 1c. Use appropriate body language.	1.1 Definition, Process, Types: Verbal-Non-Verbal, Formal-Informal, Upward-Downward, Horizontal. 1.2 Barriers of communication: Physical, Mechanical, Psychological, Language, Status. Ways to overcome barriers.	03
2. Communication in Practice	2a. Identify strengths and weakness of self. 2b. Classify different types of Communication and use it effectively. 2c. Plan & perform effective presentations. 2d. Modify intrinsic qualities.	2.1 Non-verbal communication in detail: Body language, Eye contact, Dress and appearance, color, sound, Gestures, Postures, Pictorial representations. (Maps, Charts, Graphs) 2.2 Nonverbal Codes 2.3 Presentation skills – Parameters, Appearance, use of body language, Eye contact, content preparation, Depiction of interest of audience 2.4 SWOT analysis 2.5 Brain Storming	06
3. Business Correspondence	3a. Identify various types of written communication in business situation. 3b. Apply the appropriate correspondence to the situation.	3.1 Letters: Job application and Resume writing Leave letter, Enquiry letter. 3.2 Circular, Notices, Agenda, Minutes, Email messages.	07
		Total Hrs.	16

B. LIST OF PRACTICALS / LABORATORY EXPERIENCES / ASSIGNMENTS:

Practical	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Describe Types of Communication.	Communication	04
2	Conduct Self SWOT analysis.	Communication in practice.	02
3	Outline an Introduction for Self & others.	Communication	04
4	Practice the art of LSRW (to be performed in Language lab using software).	Communication in practice.	06
5	Exhibit Professional Etiquettes.	Communication in practice.	02
6	Prepare Job Application.	Business Correspondence.	02
7	Prepare Resume.	Business Correspondence.	02
8	Demonstrate various types of Business Letters.	Business Correspondence.	02
9	Participate in Brain Storming.	Communication in practice	02
10	Practice Email Writing.	Business Correspondence.	02
11	Master the skill of oral presentation by presenting a topic through PowerPoint presentation.	Communication in practice.	02
12	Implement the art of writing Formal drafting by preparing resume & letters.	Business Correspondence.	02
Total Hrs.			32

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)			Test Answer Sheet	
		Class Room Assignments		Assignments			Assignment Book	
	TEE (Term End Examination)	End Exam	Students	End of the Course			Theory Answer Sheets	
				Total				
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Practical Answer Sheets	1.2.3.4.5
		Journal Writing		Assignments	05	--	Journal	1.2.3.4.5
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End of the Course	25	10	Practical Answer Sheets	1.2.3.4.5
Indirect Assessment	Student Feedback on Course		Students	After First PT	Student Feedback Form		1, 2, 3, 4,5	
	End of Course			End of the Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Performance	10
2	Overall presentation of given assignment	10
3	Viva voce	20
4	Activity	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	1	2	3
1	3	-	-	-	3	-				
2	3	-	-	-	3	-	2			
3	-	-	-	-	-	3	-			
4	-	-	-	-	-	3	2			
5	-	-	-	-	-	3	-			

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Professional Communication skills	S.R.Pravin, S.Chand Publications	81-219-2092-02
2	Developing Communication skills	Macmillan Publications, Revised Edition, 2011	0333929195
3	Business communication and soft skills.	G.S.R.K Babu Rao, Himalaya Publication, First Edition, 2009	978-81-8488-596-5
4	Secret of face-to-face communication.	Peter Urs, Bender, Macmillan Publication	0333937139
5	Technical communication principles and practices	Meenakshi Raman, Prakash Singh, Oxford University Press,	0-19-567695-5
6	Effective English Communication	Krishna Mohan, Raman Tata Mc Graw Hills,	13978-0-19-566804-9
7	Modern Commercial Correspondence	R.S.Pillai, Bhagwati, S.Chand & Co.	812190519-2

❖ **E-REFERENCES:**

1. https://en.wikipedia.org/wiki/Business_communication, accessed on 29th July 2021
2. <https://www.indeed.com/career-advice/career-development/types-of-business-letters> , accessed on 29th July 2021
3. <https://in.indeed.com/career-advice/resumes-cover-letters/communication-skills> , accessed on 29th July 2021
4. <https://www.youtube.com/watch?v=jaxgeXPgAz0> , accessed on 29th July 2021

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr.Rupali Londhe	Lecturer in English & Coordinator	Government Polytechnic, Nagpur.
2	Prof. Nitin Pote	Expert, Lecturer in English	Government Polytechnic, Bramhapuri
3	Prof. Ravindra Suryawanshi	Expert, Lecturer in English	NIT Polytechnic, Nagpur
4	Prof.Nitin Pathak	Expert, Lecturer in English	Kamptee Polytechnic, Nagpur
5	Dr.M.M.Machale	Lecturer in English	Government Polytechnic, Nagpur.
6	Mrs.Kamala Grace	Visiting Lecturer in English	Government Polytechnic, Nagpur.
7	Mrs.Swati Mahatme	Visiting Lecturer in English	Government Polytechnic, Nagpur.
8	Ms.Rasika Joshi	Visiting Lecturer in English	Government Polytechnic, Nagpur.
9	Mrs.Barnali Roy	Visiting Lecturer in English	Government Polytechnic, Nagpur.

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

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COURSE CURRICULUM

PROGRAMME : **DIPLOMA IN CE/ME/EE/EC/CM/IT/AE/PK/MT/TX/**
TR/MC/AI

COURSE CATEGORY: **AUDIT COURSE**

COURSE CODE : **EV151G**

COURSE TITLE : **ENVIRONMENTAL SCIENCE**

TEACHING SCHEME: **TH: 02; TU: 00; PR: 00 (CLOCK HRs.)**

TOTAL CREDITS : **02 (1 TH CREDIT = 1 CLOCK HR.)**

TH. TEE : --

PR. TEE : --

PT : --

❖ **RATIONALE:**

The world today is facing the biggest challenge of survival. Degradation of ecosystem, depletion of natural resources, increasing levels of pollution, poses major threat to the survival of mankind. The need of the hour, therefore, is to concentrate on the area of environmental science, which shall provide an insight into various environment related issues.

Environmental science is an interdisciplinary academic field that integrates physical and biological sciences, with the study of the environment. It provides an integrated, quantitative, and interdisciplinary approach to the study of environmental systems & gives an insight into solutions of Environmental problems.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Acquire the knowledge of terms related to Environmental Studies.
2. Identify natural resources and resolve problems associated with them.
3. Identify alternate energy resources and use them efficiently during their engineering practices.
4. Develop habits which will reduce various types of pollution.

5. Analyze key issues about environment and create public awareness about those environmental issues.
6. Acquire formal & non formal environmental education.

❖ **COURSE DETAILS:**

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs
1. Earth System and Resources	1a. Prepare list of historical events of earthquakes, volcanoes, Tsunami, cyclone & landslides in the world. 1b. Identify problems associated with soil, water. 1c. Differentiate weather and climate. 1d. Analyze the global water problems.	1.1 Earth Science: Concepts of Geologic time scale; earthquakes, volcanoes, Tsunami, cyclone & landslides 1.2 The Atmosphere: Weather and climate; the Coriolis Effect 1.3 Global Water Resources and Use: Present scenario, surface and groundwater issues; global problems; and its conservation. 1.4 Soil : soil erosion and other soil problems; methods of soil conservation	04
2. Concept of Biodiversity	2a. Describe Biodiversity. 2b. Identify Levels of Biodiversity. 2c. Prepare a list of biodiversity hotspots 2d. List the endangered species. 2e. Prepare a report on value of Biodiversity. 2f. Suggest methods / steps for Biodiversity conservation .	2.1 Definition of Biodiversity 2.2 Levels of biodiversity 2.3 Value of biodiversity 2.4 Threats to biodiversity, loss of biodiversity (biodiversity hotspots) 2.5 Conservation of biodiversity (modern methods of biodiversity conservation)	04
3. Energy Resources and Consumption	3a. Match the energy forms projects. 3b. Describe various forms of energy. 3c. Describe advantages and disadvantages of forms of energy. 3d. Select appropriate solutions of Efficient use of energy. 3e. Utilize techniques for energy consumption to reduce impact on environment.	3.1 Energy Consumption history 3.2 Present global energy use, Future energy needs 3.3 Energy forms:(conventional and non conventional) 3.4 Energy Conservation 3.5 Renewable Energy: Solar energy; solar electricity; biomass; wind energy; ocean waves and tidal energy; geothermal	06

4. Pollution	4a. Define pollution and pollutants. 4b. Classify various types of pollutants. 4c. Identify the Pollutants and their sources. 4d. Develop habits to reduce pollution. 4e. State the standard / limiting/ controlling values of various type of pollution.	4.1 Definition of pollution. 4.2 Air pollution: Definition, Classification, sources, effects, Prevention and ambient air quality standards. 4.3 Water Pollution: Definition, Classification, sources effects, Prevention And WHO and BIS water quality standards. 4.4 Soil Pollution/land pollution: Definition, sources, effects prevention 4.5 Noise Pollution: Definition, sources, effects, prevention. 4.6 Biomedical Waste and E-Waste – Origin, Effects and control Measures. 4.7 CPCB and MPCB norms and roles and responsibilities.	08
5. Social issues and Environment	5a. Describe sustainable development. 5b. Evaluate sources of Green house effect, acid rains, Global warming. 5c. Describe the incidences of Nuclear accidents.	5.1 Concept of development, sustainable development 5.2 Watershed management , rain water harvesting 5.3 Global Warming, greenhouse effect; ozone depletion, relevant laws and treaties 5.4 Nuclear Accidents and Holocaust: Basic concepts and their effect on climate, , relevant laws and treaties	05
6. Environmental Education	6a. Differentiate formal and non formal education. 6b. Describe various acts and their provisions. 6c. Develop awareness about environment.	6.1 Formal and non-formal education 6.2 Role of Govt. and Non-Govt. Organization 6.3 Indian constitutional provisions regarding the environment. Brief description of the following acts and their provisions: Environmental Protection Act and Prevention of Water, air and noise Pollution Act. 6.4 Concepts EIA and environmental Ethics	05
Total Hrs.			32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Assignments	Specific Learning Outcomes (Psychomotor Domain)	Units
1	Prepare report on Loss of biodiversity, its conservation and also describe biodiversity hotspots.	Concept Of Biodiversity
2	Prepare report on use of various renewable energy sources.	Energy Resources And Consumption
3	Assignment on article collection from news papers, magazines and internet on local environmental pollution.	Pollution
4	Prepare report on case study of Industrial /Nuclear / any other Disaster in India.	Social Issues And Environment

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Nil

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Nil



❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	--	--	--	--
		Class Room Assignments		Assignments	--	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	Theory Answer Scripts	1,2,3,4,5,6
				Total	--	--		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	--	--	--	--
		Journal Writing		Assignments	--	--	--	--
				Total	--	--		
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	--	--
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

Nil

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							PSO	
	1	2	3	4	5	6	7	9	10
1	3	-	-	-	2	-	-	-	-
2	3	-	-	-	2	-	2	-	-
3	3	-	-	-	2	-	2	-	-
4	2	-	-	-	2	-	-	-	-
5	3	-	-	-	2	-	2	-	-
6	2	-	-	-	2	-	3	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Environmental studies	Oxford University Press, New Delhi. 2011	0-19-807228-2
2	Environmental Science	Y.K. Singh, New Age International, New Delhi	8122418481, 9788122418484
3.	A Text Book Of Environmental Science	Arvind Kumar, APH Publishing, New Delhi	817648590X, 9788176485906
4	Environmental Engg	A Kamla & D.L.Kanth Rao, Tata Mc Graw-Hill, New Delhi	0-07-451708-2
5	A Textbook of Environmental Studies	Shashi Chawla, Tata Mc Graw-Hill, New Delhi	9781259006388
6	Environmental studies	Erach Bharucha	UGC , New Delhi

❖ **E-REFERENCES:**

1. https://en.wikipedia.org/wiki/Lists_of_nuclear_disasters_and_radioactive_incidents, accessed on 20 January 2021
2. www.legalserviceindia.com/articles/noip.htm accessed on 18 March 2021
3. <https://prezi.com/8mnz--ldkybc/apes-unit-1-earth-systems-resources/> accessed on 23 March 2021
4. <http://www.conserve-energy-future.com/AlternativeEnergySources.php>, 18 March 2021

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

Nil

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr.N.V Raut	Head of Civil Engineering, (I)	Government Polytechnic, Nagpur.
2	Dr.S.R.Kukdapwar	Head of Civil Engineering, (II)	Government Polytechnic, Nagpur.
3	Dr.Mrs.R.A.Wankhade	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
4	Mr. A.J.Fulzele	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
5	Mr.V.B. Dhait	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.

(Member Secretary PBOS)

(Chairman PBOS)



GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN COMPUTER ENGINEERING
COURSE CATEGORY	: PROGRAMME CORE COURSE
COURSE CODE	: CM201G
COURSE TITLE	: DISCRETE STRUCTURES AND GRAPH THEORY
TEACHING SCHEME	: TH: 03; TU: 00; PR: 00 (CLOCK Hrs.)
TOTAL CREDITS	: 03 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 03 Hrs.
PR. TEE EXAM	: --
PT. EXAM	: 01 HR

❖ **RATIONALE:**

This course introduced to understand the basic concepts of Discrete Structures and Graph theory so that the real life problems can be solved in the field of Data modeling, database designing, Software Engineering and network system.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Apply various logics, connectives to transform the statements.
2. Use concepts of Set Theory.
3. Identify lattices in a Hasse Diagram with various relational functions.
4. Identify various properties of a Graph.
5. Analyze types of Graphs with example.
6. Use Theorems to find spanning trees and traversing in a Graph.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs
1. Introduction to Discrete Structure and Mathematical Logic	1a. Describe discrete and continuous mathematics with justification. 1b. Describe given logic and statements with justification. 1c. Design Truth Table based on given expression of propositional logic. 1d. Use Predicate logic to transform given statement into propositional form.	1.1 Introduction to discrete structure: - Discrete mathematics - Continuous mathematics 1.2 Mathematical Logic: Define logic, Statements with Examples. 1.3 Propositional logic: - definition, Examples - Truth table. Connectives: - Negation - Conjunction - Disjunction - Implication - Biconditional 1.4 Predicate logic: - Formula and quantifiers - Normal forms.	08
2. Set Theory	2a. Identify given sets with their representations. 2b. Create Venn Diagram for given problem. 2c. Apply given set operation on given set.	2.1 Sets –Definition ,Representations of set:Empty Set, Finite and Infinite Set, Equal, Equivalent set,Subsets, Power set and Universal set. 2.2 Venn diagram: Symbol, Notations, Types: Two Set, Three set. 2.3 Set operations: Union of Sets, Intersection of Sets, Difference of Sets, Complement of a Set	06
3. Relations and Functions	3a. Compare various relations in set. 3b. Use Hasse diagram to represent ordered set. 3c. Identify type of functional relation in given set of domain element. 3d. Compute upper bound and lower bound in given Hasse diagram.	3.1 Properties of binary relations, equivalence, compatibility and partial ordering relations. 3.2 Hasse diagram 3.3 Functions: Inverse function, composition of functions, recursive functions 3.4 Lattices: Lattices as partially ordered sets; Definition and examples, properties of lattices, sub lattices, some special lattices.	08
4. Introduction to Graph Theory	4a. Identify any one application of Graph theory with justification. 4b. Calculate Degree of vertices of given graph. 4c. Identify properties of a given graph.	4.1 Definition of graph, Applications of graph theory, Examples. 4.2 Fundamentals and Terminologies: point, line, vertex, edge, loop, degree of vertices. 4.3 Properties of graph: Distance between Two Vertices, Eccentricity of a Vertex, Radius of a Connected	08

	4d. Compare given Planner and Non Planner Graph with justification.	Graph, Diameter, center, Girth. 4.4 Planner and Non Planner Graph.	
5. Types of Graph	5a. Describe given type of Graph with justification. 5b. Identify given Types of Graph. 5c. Compare various graphs with respect to properties. 5d. Compare Complete and Star graph with justification.	5.1 Null ,Trivial, Directed and Non Directed Graph 5.2 Connected, Disconnected, Regular and Simple Graph 5.3 Cycle, Cyclic, Acyclic and Wheel graph 5.4 Complete, Bibertite and Star graph.	08
6. Trees, Coloring and Traversability	6a. Use Kirchhoff's Theorem to find number of spanning trees in a given graph. 6b. Identify element of connectivity of a given graph. 6c. Calculate Chromatic Number of a given graph. 6d. Compare Euler's graph and Hamiltonian graph.	6.1 Trees: Definition of tree, Forest, Spanning trees, Kirchhoff's Theorem 6.2 Connectivity: Cut edge, vertex and connectivity. 6.3 Coloring: Chromatic number, Vertex coloring, region coloring, Coloring edges, Application of coloring. 6.4 Traversability : Euler's Path, Circuit and Euler' Circuit Theorem, Hamiltonian Graph and Path.	10
Total Hrs			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS: Nil

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Introduction to Discrete Structure and mathematical Logic	02(02)	03(00)	00(00)	05(02)
2	Set Theory	02(00)	03(03)	06(03)	11(06)
3	Relations and Functions	02(02)	03(03)	03(00)	08(05)
4	Graph Theory-Introduction	02(02)	03(03)	06(03)	11(08)
5	Graph Theory-Types of Graph	02(00)	06(03)	03(03)	11(06)
6	Graph Theory-Trees, Coloring and Traversability	02(00)	06(03)	06(06)	14(09)
	Total	12(06)	24(15)	24(15)	60(36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

T- Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Options
1	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	3	R	2	4	R	2										
2	1	U	3	2	U	3	3	U	3	2	U	3	3	U	3				3/5
3	4	U	3	5	U	3	6	U	3	4	U	3	4	A	3				3/5
4	5	U	3	5	A	3	3	A	3	6	U	3	2	A	3				3/5
5	4	A	3	6	U	3	4	A	3	5	U	3	5	A	3				3/5
6	2	A	6	6	A	6	6	A	6										2/3

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assign-ments	15	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	60	24	Theory Answer Scripts	1,2,3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	-	-	-	-
		Journal Writing		Assign-ments	-	-	-	-
				Total	-	-	-	-
	TEE (Term End Examination)	End Exam	Students	End of the Course	-	-	-	-
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION: Nil**

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	-	-	-	-	-	-	-	-
2	3	-	-	-	-	-	2	-	-
3	3	3	-	-	-	-	-	-	-
4	3	3	-	-	-	-	-	-	-
5	3	3	-	-	-	-	-	-	-
6	3	-	1	-	1	-	2	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	A Text Book of Graph Theory	R Balkrishna and K Rangnathan, Springer Second Edition	978-1-4614-4528-9
2	Discrete Mathematics and Its Applications	Kenneth H. Rosen, McGraw Hill, Seventh Edition,	978-0-07-338309-5
3	Discrete Mathematics: An open introduction	Oscar Levin, 3rd edition, 2021, e-book	978-1792901690
4	Discrete Mathematical Structures with application to Computer Science	J.P. Trembley, R. Manohar Tata McGraw-Hill, edition 1997	13:978-0-07-463113-3

❖ **E-REFERENCES:**

- <https://nptel.ac.in/courses/106/105/106105192/> , Accessed on 20th Dec 2021
- https://www.tutorialspoint.com/discrete_mathematics , Accessed on 30th Dec 2021

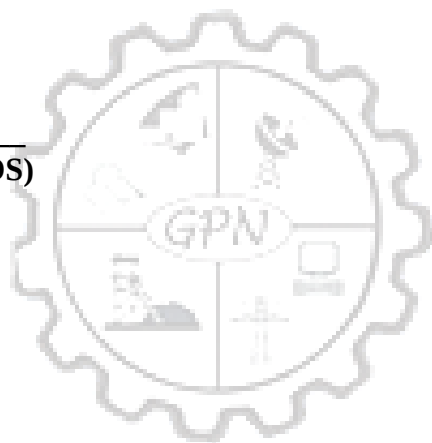
❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION :**

Nil

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr.M.V.Sarode	Head of Department (Computer Engg.Dept.)	Government Polytechnic Nagpur
2	Mr.P.S.Thakre	Lecturer in Computer Engineering	Government Polytechnic Nagpur
3	Mrs.C.R.Chaudhari	Lecturer in Computer Engineering	Government Polytechnic Nagpur
4	Mrs.D.S.Nalinde	Lecturer in Computer Engineering	Government Polytechnic Nagpur
5	Mr.Dipak Dhote	Operations Manager,	IT-Network Infosystems Pvt LTD, Nagpur
6	Dr.Rakesh Kadu	Assistant Professor, I.T.	Ramdeobaba College of Engg, and Management, Nagpur.
7	Mrs.V.A.Raje	System Analyst	MSBTE,RO Nagpur

(Member Secretary PBOS)



(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN COMPUTER ENGINEERING / INFORMATION TECHNOLOGY / ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
COURSE CATEGORY	: PROGRAMME CORE COURSE
COURSE CODE	: CM202G^{\$}
COURSE TITLE	: DATA STRUCTURES
TEACHING SCHEME	: TH:03; TU: 01;PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 05 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HRs.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs
PT. EXAM	: 01 HR

❖ **RATIONALE:**

Data Structure is an important aspect for Computer Engineering and Information Technology. Data Structures is a logical & mathematical model of storing and organizing the data in a particular way in computers. The methods and techniques of Data Structures are widely used in industries. After learning this course students will be able to identify the problem, analyze different algorithms to solve the problem and choose most appropriate data structure to represent the data.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Use the concepts of data structures to solve computing problem.
2. Apply sorting and searching algorithms to the small and large data sets.
3. Develop and execute the program for stacks and queues.
4. Construct the algorithm for different types of linked list.
5. Implement different operations on binary trees.
6. Develop the program for performing operations on graph .

❖ **COURSE DETAILS:****A.THEORY :-**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. Introduction to data structure	1a. Describe the given data structure terminologies. 1b. Illustrate the concept and needs of data structure for the given problem. 1c. Classify the given type of data structures based on their characteristics. 1d. Compute complexity of given algorithm in terms of time and space. 1e. Apply given operations on different data structures.	1.1 Definition of data structure. Basic Terminology: Elementary Data Organization 1.2 Concept and Need of data structure. 1.3 Types of data structure :- (i) Linear Data Structures (ii) Non-Linear Data Structures 1.4 Algorithm complexity :- (i) Time Complexity (ii) Space Complexity 1.5 Operations on data structures :- (i) Traversing (ii) Inserting (iii) Deleting (iv) Searching (v) Sorting (vi) Merging	03
2. Searching and Sorting	2a. Apply the algorithm of given searching and sorting methods on the given data sets. 2b. Write the programs for given searching and sorting methods.	2.1 Searching : Searching an item in data set using following methods: (i) Linear Search (ii) Binary Search 2.2 Sorting—sorting of data set in an order using following methods : (i) Selection (ii) Bubble (iii) Insertion (iv) Merge (v) Radix	06
3. Stacks and Queues	3a. Describe the given terminologies of stacks and its representation. 3b. Write the programs for given operations on stack. 3c. Analyse the results of given applications of stack. 3d. Construct given types of polish expression. 3e. Illustrate the concept	3.1 Introduction to Stack-Stack Definition, basic terminologies, examples. Stack as ADT, Stack representation in memory using array and linked list. 3.2 Operation on Stack-PUSH,POP-Stack operation conditions-Stack Full / Stack Overflow, Stack Empty/Stack Underflow 3.3 Application of Stack • Reversing a list • Polish Notation 3.4 Polish Notation:-Infix, Postfix, Prefix -Conversion of infix to postfix expression,	12

	of queue and its given representation forms. 3f. Compare the working of given types of queues based on the given parameters. 3g. Develop the program for given operation of queue.	-Conversion of infix to prefix expression, -Evaluation of postfix expression, -Evaluation of prefix expression, -Recursion, Tower of Hanoi 3.5 Introduction to Queue Queue Definition, basic terminologies, examples. Queue as ADT, Array representation and linked representation of queue. 3.6 Types of Queue :-Linear Queue, Circular Queue ,Concept of Priority queue 3.7 Queue Operations – INSERT,DELETE Queue Operations conditions –Queue Full, Queue Empty, Application of Queue	
4. Linked List	4a. Describe the given linked list terminologies. 4b. Differentiate between the working of types of linked list on given points. 4c. Construct the algorithm for given operations on linked list.	4.1 Introduction to linked list Terminologies : node, Address, Pointer, Information field/Data field, Next pointer, Null Pointer, Empty list, Dynamic memory Allocation, 4.2 Types of list :- Linear list, Circular list 4.3 Operation on singly linked list :- Traversing a singly linked list, Searching a key in linked list, Inserting a new node in linked list, Deleting a node from linked list, Counting number of nodes in a Linked List, Reversing a linked list.	08
5. Tree	5a. Describe the given concepts of trees with related terminologies. 5b. Represent the binary tree in given forms. 5c. Obtain output of given graph for given traversal method. 5d. Construct the tree using given operations on trees.	5.1 Introduction to Trees Terminologies:- tree, degree of node, degree of a tree, level of a node, leaf node, Depth / Height of a tree, In-degree and Out Degree, Path, Ancestor, descendant nodes. 5.2 Binary tree representation:- Sequential representation, Linked representation of tree 5.3 Tree types and traversal methods Types of trees :- General tree, Binary tree, Binary search tree (BST), Expression Trees Binary tree traversal :- In-order Traversal Pre- order Traversal, Post-order Traversal 5.4 Binary Search Tree Operations:- Searching a node in a BST	09

		Inserting a new node in BST Deleting a node from BST	
6. Graph	6a. Describe given graph terminologies. 6b. Represent the given graph in given forms. 6c. Interpret list and matrix for given type of graph 6d. Design the graph traversal techniques for the given graph.	6.1 Introduction to graph terminologies :- graph, node (vertices), arcs (edges), directed graph, undirected graph, in-degree, out degree, adjacent, successor, predecessor, relation, path, articulation point. 6.2 Representation of Graph:- Sequential representation, Linked representation of graph. 6.3 Adjacency Lists, Adjacency Matrix of directed and undirected graph. 6.4 Traversal used for Graph Breadth First Search Depth First Search	10

A. LIST OF PRACTICALS / LABORATORY EXPERIENCES / ASSIGNMENTS:-

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Develop and execute a 'C' program to traverse and display the elements from given array.	1. Introduction to data structure	02
2	Develop and execute a 'C' program to search a particular data from the given array using Linear search.	2. Searching and Sorting	02
3	Develop and execute a 'C' program to search a particular data from the given array using Binary search.		02
4	Develop and execute a 'C' program to sort an array using Bubble Sort .		02
5	Develop and execute a 'C' program to sort an array using Selection Sort.		02
6	Develop and execute a 'C' program to sort an array using Insertion Sort .		02
7	Develop and execute a 'C' program to perform PUSH and POP operations on stack using array.	3. Stacks and Queues	02
8	Develop and execute a program for Implementation of Recursion using Stack.		02
9	Develop and execute a 'C' program to perform INSERT and DELETE operations on queue using array.		02
10	Develop and execute a 'C' program to perform INSERT and DELETE operations on circular queue using array.	4. Linked list	02
11	Develop and execute a 'C' program for Inserting, Deleting, Traversing, Searching a node in Singly Linked List.		02
12	Develop and execute a program for inserting and deleting a node from Binary tree.	5. Tree	02

13	Develop and execute a program to traverse the tree (Inorder, Preorder, Postorder).		04
14	Develop and execute a program for traversal of graph.	6.Graph	04
Total Hrs			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Introduction to data Structures	02(02)	00(00)	00(00)	02(02)
2	Searching and Sorting	02(02)	03(03)	06(00)	11(05)
3	Stacks and Queues	02(02)	06(00)	06(06)	14(08)
4	Linked List	02(00)	03(03)	06(03)	11(06)
5	Trees	02(00)	03(03)	06(06)	11(09)
6	Graphs	02(00)	03(03)	06(03)	11(06)
	Total	12(06)	18(12)	30(18)	60(36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER

T- Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
1	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	2	R	2	3	R	2										
2	2	U	3	2	A	3	2	A	3	2	U	3	3	A	3				3/5
3	3	U	3	3	U	3	4	U	3	4	A	3	3	A	3				3/5
4	5	U	3	4	A	3	4	A	3	4	U	3	5	U	3				3/5
5	6	U	3	5	A	3	5	A	3	6	U	3	6	A	3				3/5
6	3	A	6	6	A	6	5	A	6										2/3

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	15	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	60	24	Theory Answer Scripts	1,2,3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End of the Course	50	20	Practical Answer Scripts	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form		1, 2, 3, 4,5,6	
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Correctness of algorithm	10
2	Designing the program	10
3	Debugging Ability	10
4	Appropriateness of output displayed	10
5	Viva voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:-**❖ **Computer Engineering**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	-	-	-	-	-	3	-	-
2	3	-	-	3	-	-	-	3	-
3	3	-	3	3	-	3	3	3	-
4	3	-	3	3	-	-	-	3	-
5	3	-	3	3	-	3	3	3	-
6	3	-	3	3	-	3	3	3	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **Information Technology**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	-	-	-	-	-	3	-	-
2	3	-	-	3	-	-	-	-	3
3	3	-	3	3	-	3	3	-	3
4	3	-	3	3	-	-	-	-	3
5	3	-	3	3	-	3	3	-	3
6	3	-	3	3	-	3	3	-	3

❖ **Artificial Intelligence and Machine learning**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	-	-	-	-	-	3	-	-
2	3	-	-	3	-		-	-	3
3	3	-	3	3	-	3	3	-	3
4	3	-	3	3	-	-	-	-	3
5	3	-	3	3	-	3	3	-	3
6	3	-	3	3	-	3	3	-	3

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Data Structures in 'C'	Tanenbaum, Langsman, Augenstein Pearson Education, 2003	10: 8131702294 13: 978-8131702291
2	Introduction to Data Structure : With applications	Jean Paul Tremblay, Paul Gordon Sorenson, International Student Edition ,1983	10:0070651574 13:9780070651579
3	Data Structures with C	Seymour Lipschutz, Schaum's Outline Series, 2010	10: 0070701989 13: 978-0070701984

❖ **E-REFERENCES:**

- <https://nptel.ac.in/courses/106/102/106102064/>, accessed on 12th December 2021
- <https://www.w3schools.in/data-structures-tutorial>, accessed on 12th December 2021
- <https://www.geeksforgeeks.org/data-structures/>, accessed on 12th December 2021
- https://www.tutorialspoint.com/data_structures_algorithms/index.htm, accessed on 12th December 2021

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

1. Computer system (Any computer system which is available in laboratory)
2. 'C' Compiler / GCC Compiler

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr.M.V.Sarode	HOD,Computer Engineering	G.P.Nagpur
2	Dr.A.R.Mahajan	HOD, Information Technology/AIML	G.P.Nagpur
3	Mrs.D.S.Nalinde	Lecturer in CM	Course Expert G.P.Nagpur
4	Mrs.C.R.Chaudhari	Lecturer in CM	Course Reviewer G.P.Nagpur
5	Mr.S.A.Khatri	Lecturer in CM	Course Reviewer G.P.Nagpur
6	Dr.Rakesh Kadu	Assistant Professor, I.T	Ramdeobaba College of Engg, and Management, Nagpur
7	Mr.Dipak Dhote	Operations Manager,	IT-Network Infosystems Pvt LTD,Nagpur
8	Mrs.V.A.Raje	System Analyst ,	MSBTE ,RO,Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN COMPUTER ENGINEERING
COURSE CATEGORY	: PROGRAMME CORE COURSE
COURSE CODE	: CM203G^{\$}
COURSE TITLE	: PYTHON PROGRAMMING
TEACHING SCHEME	: TH:03; TU: 00;PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 04 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs
PT. EXAM	: 01 HR

❖ **RATIONALE:**

Python is a general purpose and high level programming language. The simple syntax rules of the python programming language further makes it easier to keep the code base readable and application maintainable. It supports object oriented and structured programming fully. Python can be used to create a prototype of the software application rapidly. As an open source programming language, Python helps to curtail software development cost significantly. Its large and robust standard library makes Python score over other programming languages.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Develop logic for problem solving in python.
2. Develop python program to demonstrate looping and control statements.
3. Develop Python functions to facilitate code reuse.
4. Perform operation on python data structure.
5. Use Python to read and write files.
6. Implement object oriented concepts using python

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs
1. Fundamentals of Python	1a. Describe given unique features of python programming. 1b. Distinguish between given versions of python programming & create python programming environment. 1c. Use python building block for writing python program in given situation. 1d. Develop a program in python code to display given contents. 1e. Classify given data types based on their characteristics.	1.1 Definition of Python and history of Python, Unique features of Python. 1.2 Python 2.x and Python 3.x differences, Installation of Python and Environment Setup 1.3 Python building blocks- identifiers, keywords, indentation, variable and comments 1.4 Executing simple Program using python script & displaying it. 1.5 Python Data Types : Numbers, list, tuple, string, Dictionary, set, Mutable and Immutable, Bool Conversion between data types	06
2. Operators and Program Control Flow in Python.	2a. Categorize given types of operators based on their operations in Python. 2b. Develop python programs using given conditional control structures. 2c. Develop python program using given iterative statements. 2d. Describe the given keywords with example. 2e. Write the python code for given range function on various program control flow statements.	2.1 Operators in python: Arithmetic Operators, Relational Operators, Logical Operators, Membership Operators, Identity Operators, Bitwise Operators, Assignment Operators, Operators Precedence, Evaluating Expression, Type Casting. 2.2 Program control flow using conditional statements-The if Statement, The if-else Statement, The if-elif Statement, Nested if Statements. 2.3 Program control flow using iterative statements - For Loop, While Loop, Nested Loops 2.4 Loop manipulation using Break ,Continue and pass 2.5 The Range Function- Introduction to range(), Types of range() function, Use of range() function	08
3. Python Data	3a. Write a code using python program for given problem	3.1 List:- A. Defining list and list slicing Creating, Accessing, Slicing,	08

Structure	statement. 3b. Write python program to use tuple in given problem statement. 3c. Write python program to use set in given problem statement. 3d. Write python program to use dictionary in given problem statement.	Reassigning(mutable), Deleting a python list B. Python List Operations C. Built-in List Functions D. Built-in Methods to alter a Python list. 3.2 Introduction to Tuples:- A. Create, access, slice, delete tuple in Python. B. Tuple Operations. C. Tuple Methods and Built-in Functions 3.3 Sets: Accessing values in Set, deleting values in Set and updating Set. Basic Set operations. 3.4 Introduction to Dictionaries A. Creating a Dictionary, Accessing item, dictionary(mutable) B. Membership, Traversing a Dictionary C. Dictionary methods and Built-in functions	
4. Functions	4a. Use function for the given problem. 4b. Develop function based on various arguments in given problem. 4c. Compare key terms on given points. 4d. Determine validity of variable for given program. 4e. Develop relevant user defined function for given problem using python. 4f. Justify the use of module concept in given python problem. 4g. Justify the use of packages in given python problem.	4.1 Defining a function, syntax of a function, Calling a function. 4.2 Function Arguments:-Required arguments, Keyword arguments, Default arguments, Variable-length arguments 4.3 Pass by reference V/S Pass by value, return statement. 4.4 Scope and Lifetime of variables 4.5 Defining a user defined function, advantage of user defined function and example of user defined function 4.6 Modules: Import statement, Executing modules as scripts, Module Search Path 4.7 Packages Importing * From a Package Intra-package Reference	08
5. Python Files Input and Output	5a. Write given file operation using python code. 5b. Write the python code for given file operation. 5c. Justify the use of given file methods on given	5.1 Python file operation A. Open a file B. Read a file C. Close the file 5.2 Writing, Renaming & Deleting to Files in Python. 5.3 File methods (in-built) in python-close,	08

	python problem.	flush, readable, readlines, seek, tell, truncate, writelines 5.4 Python-MySQL Interfacing, Python GUI framework, GUI Programming in Python using Tkinter	
6. Object Oriented Approach in Python	6a. Create classes for a given problem statement. 6b. Create objects for a given problem statement. 6c. Justify the use of inheritance concept for given problem statement. 6d. Justify the use of polymorphism concept for given problem statement.	6.1 Creating classes, Defining member function, Constructors in Python (Using init__), Private Members 6.2 Creating instance objects, Accessing attributes of a class, Class Attributes v/s Instance Attributes, Using __del()__, Using __str()__ 6.3 Concept of Inheritance , types of Inheritance- Single Inheritance, Multilevel Inheritance, Multiple Inheritance, Hierarchical Inheritance, Hybrid Inheritance, super() in derived class to invoke _init_(), Overriding methods 6.4 Polymorphism in python- Operator Overloading, Function Overloading	10
Total			48

B. LIST OF PRACTICALS / LABORATORY EXPERIENCES / ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	1. Installing python and environment setup to work with python 2. Develop and execute python program to display welcome message on screen.	1. Fundamental s of Python	02
2	1. Develop and execute at least 2 Python programs using different data types (numbers, string, tuple, list, dictionary) 2. Develop and execute any python program to show conversion between data types. Develop a program to add two numbers in which one variable has the string value and second has integer.		02
3	1. Develop and execute a python program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice. 2. Develop and execute a Python Program to Calculate the square root of a number by Newton's Method.	2. Operators and Program control flow in Python	02
4	1. Develop and execute a python program to check whether the given integer is positive or negative 2. Develop and execute a python program to find largest of three Numbers.		02

5	- Develop and execute a python program to print prime numbers between 100 to 500. - Develop and execute a python program to ADD ODD numbers less than 20. - Develop and execute a python program to print the pattern <pre> * ** *** ** * </pre> Using nested for loop		02
6	- Develop a program to create a list, add elements to list, delete elements from the list and perform various operations on the list. - Develop & execute a python Program to find the maximum of a list of numbers.	3. Python data structure	02
7	- Develop & execute a python Program to create a tuple, access tuple element using indexing, negative indexing, slicing and delete tuple. - Develop & execute a Python program to create a list of tuples from a given list having a number and its cube in each tuple.		02
8	- Develop & execute a python program to create a set, add items to set, access set items ,remove item from set and delete set. - Perform various set operations like set union, set interaction, set difference in python and display result.		02
9	Develop & execute a python program to create a dictionary, add elements to the dictionary, and delete elements from the dictionary.		02
10	- Write and execute a python program for designing an arithmetic calculator using a function. - Develop a function that takes the age in years and returns the age in days.	4. Functions	02
11	- Develop and execute a python program to accept the length of three sides of a triangle as inputs. The program should indicate whether or not the triangle is a right angled triangle (use Pythagorean theorem). - Develop and execute a python program to create a new list of numbers by squaring every number from list.		02
12	- Develop and execute a python program to create a simple module and import it. - Develop and execute a python program to create a simple package and import it.		02

13	1. Develop and execute a python program to create a “name.txt” file and write your full name in it by user input. 2. Develop and execute a python program to create a “sample.txt” file add any random 50 lines to it also count the total number of uppercase, lower case, and digits used in the text file “sample.txt”	5. Python files Input and Output	02
14	1. Develop and execute a python program to copy the contents of a file ABC.txt to another file XYZ.txt. 2. Develop and execute a python program to Replace all spaces from text with – (dash) in XYZ.txt created above.		02
15	1. Develop & execute a Python program to create a Employee class with name, contact and experience instance attributes. 2. Develop & execute a Python program to create a “programmer” object that will inherit all of the variables and methods of the parent Employee class and display it.	6.Object Oriented Approach In Python	02
16	1. Develop & execute a Python program that allows the user to enter the last names of five candidates in a local election and the number of votes received by each candidate. The program should then output each candidate’s name, the number of votes received, and the percentage of the total votes received by the candidate. Your program should also output the winner of the election.		02
Total Hrs			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Fundamentals of Python	02(00)	00(00)	00(00)	02(00)
2	Operators and Program control flow in python	02(02)	03(03)	06(00)	11(05)
3	Python data structure	02(02)	06(00)	06(06)	14(08)
4	Functions	02(02)	03(03)	06(03)	11(08)
5	Python files Input and Output	02(00)	03(03)	06(06)	11(09)
6	Object Oriented Approach In Python	02(00)	03(03)	06(03)	11(06)
	Total	12(06)	18(12)	30(18)	60(36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

T- Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1R2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Options
1	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	2	R	2	3	R	2	4	R	2										
2	2	U	3	3	U	3	3	U	3	2	U	3	4	U	3				3/5
3	4	U	3	5	U	3	6	U	3	5	U	3	6	U	3				3/5
4	2	A	3	3	A	3	5	A	3	3	A	3	4	A	3				3/5
5	2	A	3	3	A	3	5	A	3	3	A	3	6	A	3				3/5
6	4	A	6	6	A	6	5	A	6										2/3

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	15	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	60	24	Theory Answer Scripts	1,2,3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End of the Course	50	20	Practical Answer Scripts	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form		1, 2, 3, 4,5,6	
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Correctness of logic of a program	20
2	Debugging ability	10
3	Quality of input and output displayed (messaging and formatting)	10
4	Submit report in time /Viva Voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	3	3	-	-	3	-	3	3
2	3	-	3	-	-	-	-	3	-
3	3	3	3	-	-	3	3	3	3
4	3	-	-	3	-	3	3	-	-
5	3	3	-	3	-	-	-	-	-
6	3	3	3	3	-	3	3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Learning Python,	Mark Lutz ,5th Edition O'Reilly Publication	978-1449355739
2	Python Cookbook	David Beazley, Brian K. Jones , 3rd Edition	978-1449340377
3	Head-First Python	Paul Barry, 2nd Edition, O'Reilly Publication	978-1491919538

❖ **E-REFERENCES:**

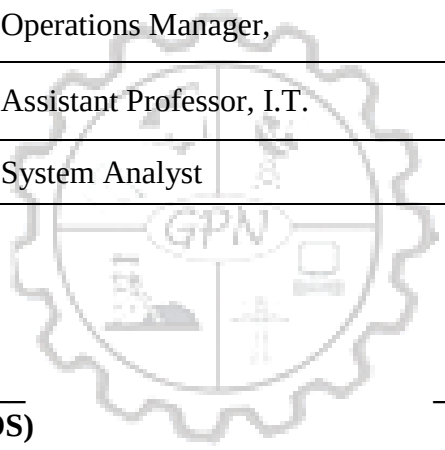
- https://onlinecourses.nptel.ac.in/noc22_cs26/preview, accessed on 15th January 2022,
- <https://youtu.be/QJuQDU1D5KQ> accessed on 15th January 2022

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

1. Computer system
(Any computer system with basic configuration)
2. Python Interpreter

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr.M.V.Sarode	Head of Department (Computer Engg.Dept.)	Government Polytechnic Nagpur
2	Mr.A.A.Uike	Lecturer in Computer Engineering	Government Polytechnic Nagpur
3	Mr.M.A.Rahman	Lecturer in Computer Engineering	Government Polytechnic Nagpur
4	Mr.P.S.Thakre	Lecturer in Computer Engineering	Government Polytechnic Nagpur
5	Mr.Dipak Dhote	Operations Manager,	IT-Network Infosystems Pvt LTD, Nagpur
6	Dr.Rakesh Kadu	Assistant Professor, I.T.	Ramdeobaba College of Engg, and Management, Nagpur.
7	Mrs.V.A.Raje	System Analyst	MSBTE,RO Nagpur



(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN COMPUTER ENGINEERING / INFORMATION TECHNOLOGY /AIML
COURSE CATEGORY	: PROGRAMME CORE COURSE
COURSE CODE	: CM204G^{\$}
COURSE TITLE	: DATABASE MANAGEMNT SYSTEM
TEACHING SCHEME	: TH:03; TU: 00;PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 04 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs
PT. EXAM	: 01 HR

❖ **RATIONALE:**

Database Management Systems (DBMS) are vital components of modern information systems. The course focuses on the fundamentals of knowledge base and relational database management systems. In this course the relational data model, relational query languages, relational database design are reviewed. The students will have theoretical foundation required for working with different types of relational database products, such as ORACLE.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Use fundamentals of database management system.
2. Design database by using different models.
3. Design the normalized relational database for system.
4. Execute SQL commands for database operations.
5. Build PL/SQL code for database application.
6. Use concept of NOSQL database system.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs
1. Database System Concept	1a. Compare systems based on given parameters. 1b. Compare given data management system based on various attributes. 1c. Determine the level of data independence achieved based on given situation with justification. 1d. Describe given function of database administrator. 1e. Describe architecture of Client/ Server system. 1f. State given Codd's law with justification.	1.1 An Introduction to database. Data, database, DBMS, Disadvantages of file processing system, and advantages of DBMS over file processing system, Application of database. 1.2 Definition of RDBMS, Difference between DBMS and RDBMS, Names of various DBMS and RDBMS software 1.3 Data abstraction, Instance and schema, Data independence - Logical and Physical Independence, Data abstraction levels. 1.4 Components of DBMS and overall Structure of DBMS. Database Users, functions of Database Administrator. 1.5 Introduction to client server architecture. Two/Three tier Architecture. 1.6 The 12 Rules (Codd's laws) for fully functional RDBMS.	06
2. Relational Models and Constraints	2a. Compare given data models based on given parameters. 2b. Predict the suitable key required in given scenario. 2c. Design E-R Model for given system. 2d. Apply the constraint to given schema.	2.1 Data Model: Structure of: Network Model, Hierarchical Model, Relational Model 2.2 Relational Model - Basic Concepts, Entity, Attributes, Tuple and Domains. Key Concepts-Primary key, Super key, Alternate key, Candidate key, Composite key and Foreign key. 2.3 E-R model- Components of ER Model Types of attributes, weak & strong entity set. 2.4 Integrity Constraints: Domain Integrity Constraints, Entity integrity Constraints & Referential Integrity Constraints, on delete cascade.	08
3. Relational	3a. Illustrate the significance of	3.1 Purpose of normalization, Data Redundancy, insert, update, delete	08

Database Normalization	Normalization. 3b. Identify functional dependency based on given situation. 3c. Apply normalization rule to given schema.	anomalies, Decomposition properties 1.Lossless Decomposition, 2.Dependency Preservation 3.2 Functional dependency (FD), Classification of Functional dependency, properties of FD. 3.3 Normalization using: 1NF, 2NF,3NF and BCNF.	
4. SQL and Database Languages	4a. Use data types for database design. 4b. Design SQL queries to create Relational database. 4c. Apply clauses to given database for data retrieval. 4d. Apply various operators & functions to retrieve data from database. 4e. Design the database report from given key terms. 4f. Apply join concept to retrieve data from more than one object/schema. 4g. Apply index method to database for data retrieval.	4.1 Data Types in SQL 4.2 Components of SQL: DDL- create, alter, rename, drop, truncate, DESC, DML- insert, update, delete, TCL begin transaction, commit, rollback, save-point, DCL- Grant & Revoke 4.3 Clauses: select, from, where, group by, having and order by 4.4 Operators: Arithmetic, relational, set, comparison, Functions: Aggregate, string & conversion functions. 4.5 Null Value, sub-query, Nested Sub-queries, break, compute command & compute functions. 4.6 Join Concept, types of join- Natural Join, Self join, Outer join types- left, right & Full outer join, View 4.7 Indexes: Creating Indexes, Dropping Indexes.	10
5. PL/SQL	5a. Identify various components of the PL/SQL. 5b. Use control structure to write PL/SQL Code. 5c. Distinguish between exception handling based on given situation. 5d. Create different cursor to store more than one record. 5e. Design package to store different procedure. 5f. Create PL/SQL function for given problem statement.	5.1 Introduction of PL/SQL, Advantages of PL/SQL ,The PL/SQL Block Structure, PL/SQL execution environment, PL/SQL data Types, Variables, Constants 5.2 Control Structure: Conditional Control, Iterative Control, Sequential Control. 5.3 Exception handling: Predefined Exception, User defined Exception. 5.4 Cursors: Implicit and Explicit Cursors, Declaring, Opening and Closing a Cursor, Fetching a Record from Cursor, Cursor for loops, Parameterized Cursors. 5.5 Procedures: Advantages, Creating, Executing and Deleting a Stored procedure. 5.6 Functions: Advantages, Creating &	10

	5g. Create database trigger using PL/SQL for given problem statement.	Deleting a Function, use of Package 5.7 Database Triggers: Use of Database Triggers, Types of Triggers, Syntax for Creating Trigger, Deleting Trigger.	
6. Introduction to NOSQL Database	6a. Describe NOSQL database model & define given type of NOSQL database. 6b. Explain given terminology in context with NOSQL database. 6c. Compare given databases.	6.1 Overview and History of NoSQL Databases. Definition of the Four Types of NoSQL Database 6.2 The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases 6.3 Comparison of relational databases to new NoSQL stores, MongoDB, Cassandra, HBASE, Neo4j use and deployment, NoSQL approach, Key-Value and Document Data Models, NoSQL Key/Value databases using MongoDB	06
Total Hrs.			48

B. LIST OF PRACTICALS / LABORATORY EXPERIENCES / ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Install & configure Database product (such as MYSQL, ORACLE or any other relational product)	1. Database System Concept	02
2	Design database by using Network Model, Hierarchical Model, Relational Model.	2. Relational Models and constraints	02#
3	Design Entity Relationship model for any one of the given databases (School, Banking, Hostel, Hospital)		02
4	Design a Normalized Database. Identify available dependencies in created database. Identify types of used normal form.	3. Relational Database Normalization	02
5	Create & Execute DDL commands in SQL & Apply various Integrity constraints on created table.	4. SQL and	02
6	Create & Execute DML commands in SQL.		02
7	Execute Queries using Arithmetic operators, Set operator, Relational operator and Comparison Operator to retrieve data.		02

8	Execute queries using Aggregate functions- Min, Max, Sum, Count, Avg.	Database Languages	02
9	Execute query using String functions, Data Conversion functions such as To char(), To Number() and To date().		02#
10	Execute query using select command with – Where, having, group by , order by		02#
11	Execute sub query & Nested Sub queries to retrieve data from more than one table. Use break & compute command, apply different compute functions.		02
12	Execute the queries for implementation of Inner, Outer and Cross Join.		02
13	1.Execute DCL and TCL commands in SQL 2.Execute Views & Indexes in SQL.		02
14	1.Write the basic PL/SQL Programs. 2.Write a PL/SQL programs using control statements.	5.PL/SQL	02
15	Write PL/SQL Programs using Iterative Control Statements.		02
16	Write a PL/SQL code to implement implicit and explicit cursors.		02#
17	Write PL/SQL Programs based on Exceptions handling.(Predefined and user-defined exceptions)		02#
18	Write PL/SQL code for creating Procedures, functions and package.		02
19	Create database triggers. Use DML operations to fire created trigger.		02
20	Install & configure MangoDb & Run basic MangoDb commands	6.Introduction to NOSQL database	02
21	Store a data as documents in mangoDB and execute basic command on it. Like db.find(),db.aggregate()		02
Total Hrs			32

indicates optional practical's.

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Database System Concept	02(02)	03(03)	00(00)	05(05)
2	Relational Models and constraints	02(02)	06(03)	06(00)	14(05)
3	Relational Database Normalization	02(02)	03(03)	06(03)	11(08)
4	SQL and Database Languages	02(00)	06(03)	06(03)	14(06)
5	PL/SQL	02(00)	03(03)	06(06)	11(09)
6	Introduction to NOSQL database	02(00)	03(03)	00(00)	05(03)
	Total	12(06)	24(18)	24(12)	60(36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

T- Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1R2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Options
1	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	2	R	2	3	R	2										
2	1	U	3	2	U	3	3	U	3	1	U	3	2	U	3				3/5
3	2	U	3	4	U	3	5	U	3	3	U	3	4	U	3				3/5
4	4	U	3	2	A	3	6	U	3	5	U	3	6	U	3				3/5
5	2	A	3	3	A	3	3	A	3	4	A	3	3	A	3				3/5
6	4	A	6	5	A	6	5	A	6										2/3

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assign-ments	15	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	60	24	Theory Answer Scripts	1,2,3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	40	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assign-ments	10	--	Journal	1, 2, 3,4,5,6
				Total	50	20		
	TEE (Term End Examination)	End Exam	Students	End of the Course	50	20	Practical Answer Scripts	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Correctness of logic of a program	20
2	Debugging ability	10
3	Quality of input and output displayed (messaging and formatting)	10
4	Submit report in time /Viva Voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:CM**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	-	3	-	-	3	3	-	-
2	-	3	-	-	-	3	3	-	3
3	3	3	3	-	-	3	3	-	3
4	3	3	3	3	-	3	-	3	-
5	3	3	3	3	-	-	-	3	3
6	3	-	-	3	-	-	3	3	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:IT**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	-	3	-	-	3	3	-	-
2	-	3	-	-	-	3	3	-	3
3	3	3	3	-	-	3	3	-	3
4	3	3	3	3	-	3	-	3	-
5	3	3	3	3	-	-	-	3	3
6	3	-	-	3	-	-	3	3	-

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:AIML**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	-	3	-	-	3	3	-	-
2	-	3	-	-	-	3	3	-	3
3	3	3	3	-	-	3	3	-	3
4	3	3	3	3	-	3	-	3	-
5	3	3	3	3	-	-	-	3	3
6	3	-	-	3	-	-	3	3	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Database System Concepts	Abraham Silberschatz, Henry F. Korth And S. Sudarshan, Mcgraw hill Education, 6 th Edition, 2013	9789332901384
2	Introduction to Database Management Systems	2006 ISRD Group, Tata McGrawHill Education, 2005.	9780070591196
3	An Introduction to Database System	Bipin Desai, West Publishing Company, 1997	13: 9780314667717
4	Database Systems TheComplete Book	Hector Garcia-Molina Jeffrey D.Ullman Jennifer Widom, PearsonEducation Inc, 2,2002	0-13-606701-8 978-0-13-606701-6

❖ **E-REFERENCES:**

- <http://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm> , accessed on 29th January 2022
- <http://www.studytonight.com/dbms/rdbms-concept.php>, accessed on 29th January 2022
- <https://www.youtube.com/watch?v=0mn7wIAdu98>, accessed on 29th January 2022

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

1. Personal Computer with Operating system (XP, Windows etc)
2. Open Source Database Tools (Oracle/ Mysql)

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr.M.V.Sarode	Head of Department (Computer Engg.Dept.)	Government Polytechnic Nagpur
2	Dr.A.R.Mahajan	HOD, Information Technology/AIML	G.P.Nagpur
3	Mr.A.A.Uike	Lecturer in Computer Engineering	Government Polytechnic Nagpur
4	Mr.M.A.Rahman	Lecturer in Computer Engineering	Government Polytechnic Nagpur
5	Mr.P.S.Thakre	Lecturer in Computer Engineering	Government Polytechnic Nagpur
6	Mr.Dipak Dhote	Operations Manager,	IT-Network Infosystems Pvt LTD, Nagpur
7	Dr. Rakesh Kadu	Assistant Professor, I.T.	Ramdeobaba College of Engg, and Management, Nagpur.
8	Mrs. V .A. Raje	System Analyst	MSBTE,RO Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN COMPUTER ENGINEERING
COURSE CATEGORY	: PROGRAMME CORE COURSE
COURSE CODE	: CM205G
COURSE TITLE	: COMPUTER COMMUNICATION AND NETWORK**
TEACHING SCHEME	: TH:03 TU: 00;PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 04 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 01 HRs (Objective Type Online Examination)
PR. TEE EXAM	: 02 HRs
PT. EXAM	: 30 Min(Objective Type)

❖ RATIONALE:

A data communication and computer network has been growing with rapid technological progress. Computer communication through networking becomes essential part of our life. By considering importance of networking in day to day life, it is essential for students to know the basic concept of network like network classification, network topologies, and network devices. This course deals with the important and techniques related to data communication.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Draw a network architecture for IT infrastructure.
2. Apply relevant transmission media and switching techniques.
3. Configure different TCP/IP services.
4. Compute the transmission error in network model.
5. Identify and configure various networking devices.
6. Design addressing scheme for network model.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. Fundamentals of Data Communication and Computer Network	1a. Identify role of the given component in the process of data communication. 1b. Choose the appropriate terminologies related to data communication for the given problem statement. 1c. Select the suitable mode of communication for given example. 1d. Identify network architecture for given situation.	1.1 Process of data communication and its component: Transmitter, receiver medium, Message, protocol. 1.2 Protocols, standards, standard organization, Bandwidth, Data Transmission rate, Baud Rate and Bits per second. 1.3 Modes of communication(simplex, half duplex ,Full duplex),Analog signal and Digital signal, Analog and Digital transmission: Analog To Digital, Digital To Analog Conversion. Fundamental Of Computer Network: 1.4 Definition And Need Of Computer Network, Application, Network Benefits, Classification Of Network: LAN,WAN,MAN,Network Architecture: Peer To Peer, Client Server Network	04
2. Transmission Media and Switching	2a. Label the parts of given communication media. 2b. Select the given multiplexing technique for the given problem statement. 2c. Identify the switching technique based on the given problem statement.	2.1 Communication Media: Guided Transmission Media: Twisted-Pair Cable, Coaxial Cable Fiber-Optic Cable, Unguided Transmission Media: Radio Waves, Microwaves, Infrared, Satellite. 2.2 Multiplexing: Frequency-Division Multiplexing Time –Division Multiplexing 2.3 Switching: Circuit-switched network packet-switched network	08
3. OSI /TCP IP Reference Models	3a. Select the suitable function of the layer based on the given problem statement. 3b. Choose the suitable function and features of the given layer of TCP/IP model.	3.1 OSI reference Model: Layers of the OSI reference Model (Functions and features of each layer)-Physical Layer, Data-Link Layer, Network Layer, Transport Layer, Session Layer, Presentation Layer, Application Layer 3.2 TCP/IP Model: Layered Architecture Link ,Internet, Transport layer and application layer	10
4. Error Detection, Correction	4a. Select the type of error in data communication. 4b. Identify the error	4.1 Types of Errors: Single Bit Error and Burst Error, Redundancy 4.2 Error Detection: Longitudinal Redundancy Check(LRC), Vertical	08

and Wireless Communication	detection method for the given problem statement. 4c. Select the IEEE standard for the given problem statement. 4d. Identify the components of given Bluetooth architecture.	Redundancy Check(VRC), Cyclic Redundancy Check(CRC) 4.3 IEEE standards: 802.1,802.2,802.5,wireless LANs:802.11 Architecture, MAC Sublayer, Bluetooth Architecture: Piconet, Scatternet	
5. Network Topologies And Network Devices	5a. Select relevant network topology for the given situation. 5b. Choose proper networking device for the given situation.	5.1 Network Topologies: Introduction, Definition, Selection, Criteria, Types of Topology-i) Bus ii)Ring iii)Star iv)Mesh v)Tree vi)Hybrid 5.2 Network Connecting Devices: Hub, Switch, Router, Bridge, Gateway, Modem, Repeater, Access Point.	08
6. Flow control & IP Addressing	6a. Identify the terms used in line discipline. 6b. Select the suitable flow control technique for the given problem statement. 6c. Apply sub netting to the given addressing scheme. 6d. Define Domain Name System.	6.1 Line Discipline : ENQ /ACK ,Poll / Select 6.2 Flow Control: Stop and wait, sliding Window flow control, Go Back N ARQ, Selective Repeat ARQ 6.3 Addressing Scheme: IP protocol IPV4,IPV6,five classes of IP V4,Subnet and Masking 6.4 Domain Name System: Introduction, generic domain, country domain, inverse domain, working of DNS	10

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Install and configure network interface card	1. Fundamentals of data communication and computer Network	02
2	Draw a various sketches of computer network		02
3	Prepare and test straight and cross UTP cables	2.Transmission Media & Switching	04
4	Create desired standard network cable and test by using cable tester		04
5	Run basic network commands : ipconfig, ping, netstat, nslookup,traceroute	3.OSI /TCP IP Reference Model	02
6	Connect Computers using wireless media.	4.Error Detection, Correction and Wireless Communication	04
7	Develop C program for CRC Error detection		02
8	Connect Computers using given topology with wired media.	5.Network topologies &	04

9	Share a network printer on a network and print a document on it from a different computer on a network	Network Devices	02
10	Share files and directories from one computer to other computer on a network		02
11	Configure Static and Dynamic IP address	6. Flow Control & IP addressing	04
Total Hrs			32

❖ **SPECIFICATION TABLE FOR THEORY PAPER:**

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Fundamental of data communication and computer network	02(00)	02(00)	02(00)	06(00)
2	Transmission Media and Switching	02(00)	04(02)	04(00)	10(02)
3	OSI /TCP IP Reference Models	02(00)	04(02)	04(00)	10(02)
4	Error Detection, Correction and Wireless Communication	02(00)	04(00)	04(02)	10(02)
5	Network Topologies And Network Devices	02(00)	04(00)	04(02)	10(02)
6	Flow control & IP Addressing	02(00)	06(00)	06(02)	14(02)
	Total	12(00)	24(04)	24(06)	60(10)

R – Remember

U – Understand

A – Analyze / Apply

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:**

T-Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Options
Q. No 01 To 35	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	30/35
	6	R	2	2	U	2	2	U	2	2	A	2	2	A	2	
	3	U	2	3	U	2	3	A	2	3	A	2	4	U	2	
	4	U	2	4	A	2	4	A	2	5	U	2	5	U	2	
	5	A	2	5	A	2	6	A	2	6	A	2	6	A	2	
	6	U	2	6	U	2	6	U	2	2	U	2	3	U	2	
	4	A	2	5	A	2	6	A	2	1	U	2	1	A	2	

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	15	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	60	24	Theory Answer Scripts	1,2,3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End of the Course	50	20	Practical Answer Scripts	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form		1, 2, 3, 4,5,6	
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Install and configure network interface card, share files, directories , printer	10
2	Performance	20
3	Identify cables, connectors ,crimp network cables using tools	10
4	Viva Voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes(PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	-	2	-	-	-	-	-	-
2	3	-	-	2	-	-	-	-	-
3	3	2	-	-	-	-	3	-	-
4	3	-	2	2	2	-	-	-	-
5	3	-	-	-	2	1	3	-	1
6	3	2	-	-	-	-	3	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Data Communication and Networking	Forouzan Behrooz A. Tata Mcgraw Hill, New Delhi,2006	9780-07-296775-3
2	Computer Networks	Andrew S Tanenbaum PHI Learning Pvt LTD, Delhi	13: 978-0-13-212695-3
3	Data Communication and Networks	Achyut Gobole The McGraw Hill,New Delhi,2006	0070472971
4	Internetworking with TCP/IP Principles, Protocols and Architectures	Comer Douglas E. PHI Learning Pvt LTD , Delhi	81-203-2065-4

❖ **E-REFERENCES:**

1. <https://www.geeksforgeeks.org/layers-of-osi-model> accessed on 3/8/2022
2. http://www.tutorial-reports.com/wireless/wlanwifi/wifi_architecture.php accessed on 3/8/2022
3. <https://www.javatpoint.com/transmission-media> accessed on 3/8/2022
4. <https://www.geeksforgeeks.org/network-devices-hub-repeater-bridge-switch-router-gateways/> accessed on 3/8/2022
5. <https://www.guru99.com/types-of-ip-addresses.html> accessed on 3/8/2022

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

1. Computer System
2. Network Cable Cat 5/Cat 6
3. Crimping Tool
4. UTP Cable tester
5. Network Cable Connection
6. Network Trainer Kit

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr.M.V.Sarode	HoD, Computer Engg.Deptt.	Government Polytechnic, Nagpur.
2	Mrs.C.R.Chaudhari	Lecturer	Government Polytechnic, Nagpur
3	Mr.S.A.Khatri	Lecturer	Government Polytechnic, Nagpur
4	Mrs.D.S.Nalinde	Lecturer	Government Polytechnic, Nagpur
5	Mr.Dipak Dhote	Operations Manager	IT-Network Infosystems PvtLTD,Nagpur
6	Dr. Rakesh Kadu	Assistant Professor, I.T.	Ramdeobaba College of Engg, and Management, Nagpur.
7	Mrs.V.A. Raje	System Analyst	MSBTE,RO Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN COMPUTER ENGINEERING
COURSE CATEGORY	: ENGINEERING SCIENCE COURSE
COURSE CODE	: EC215G
COURSE TITLE	: DIGITAL TECHNIQUES
TEACHING SCHEME	: TH : 03; TU: 00; PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 04 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs
PT. EXAM	: 01 HR

❖ RATIONALE:

Digital techniques are concerned to digital circuits and digital technologies that are operated on digital signal. This course deals with of digital electronics which is a field of electronics involving the study of digital signals and the engineering of devices that use or produce them. It deals with learning the concepts of number systems, logic gates, combinational and sequential logic circuits. Now the days, many electronic systems are digitized. Hence, this course is designed for students to know the concept of a digital system which emphasizes on the combinational and sequential logic design.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Interpret number system for various applications of digital system.
2. Use Boolean expression and logic gates to realize logic circuits.
3. Build combinational circuits using logic gates.
4. Use suitable multiplexers and de-multiplexers for various systems.
5. Design sequential circuits for various applications.
6. Develop registers and counters for specific application.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs
1. Digital system and Number systems	1a. Compare analog and digital systems on the basis of given points. 1b. Convert given number into given number system. 1c. Perform given binary addition and subtraction.	1.1 Digital and Analog System. Comparison of analog and digital system. Digital signals - Logic levels. 1.2 Number systems - Binary, Decimal, Octal and Hexadecimal, conversion of number from one number system to another system. 1.3 Binary Arithmetic - Binary addition, subtraction, multiplication and division, Binary subtraction by using 1's & 2's complement.	07
2. Logic gates & Boolean Algebra	2a. Examine the output of given logic gates using truth table. 2b. Develop logic circuit for Boolean equation upto three variables by using given Boolean algebra. 2c. Design given basic logic gates using universal gates.	2.1 Definition and types of Logic Gates. Logic Gates - NOT, OR, AND, NAND, NOR, EX-OR and EX-NOR Gates, Boolean equation, symbols, Operating principle and truth table of logic gates. 2.2 Basic laws of Boolean Algebra, De-Morgan's theorem. 2.3 Universal logic gates, Design of other logic gates using universal gates.	08
3. Combinational Logic Design	3a. Design given logic circuits in SOP or POS form for given logical expression. 3b. Minimize given logic expression using K-map. 3d. Build given circuits using logic gates. 3e. Design given type of decoder. 3f. Design given binary converters.	3.1 Logic functions – Sum of product (SOP), Product of sum (POS), Min-term and Max-term, Conversion between SOP and POS forms, representation of logical function. 3.2 K-map reduction technique - Minimization up to variables. Don't care condition. 3.3 Binary half and full adder binary half and full subtractor. 3.4 BCD to 7 Segment decoder. 3.5 Binary to gray and gray to binary conversion.	08
4. Multiplexers and	4a. Design of multiplexers for given input.	4.1 Multiplexers - Types, truth table, advantages, design steps and applications of multiplexers 2:1, 4:1,	08

Demultiplexers	4b. Design given higher order multiplexer tree using lower order multiplexer. 4c. Use suitable demultiplexer to implement given logic expression. 4d. Design given higher order demultiplexer tree using lower order demultiplexer. 4e. Distinguish given multiplexers and demultiplexers.	8:1 and 16:1. 4.2 Multiplexers tree 4.3 Demultiplexer – Types, truth table, advantages and applications of demultiplexers 1:2, 1:4 and 1:8. 4.4 Demultiplexers tree upto 1 to16 demultiplexers. 4.5 Comparison between multiplexers and demultiplexers.	
5. Sequential Circuits	5a. Compare given combinational and sequential logic systems. 5b. Describe given one bit memory cell and RS latch. 5c. Classify given types of flipflops. 5d. Describe given race around condition with suitable example. 5e. Convert given one type of flip flop to another type.	5.1 Comparison of combinational and sequential logic systems, Triggering Methods. 5.2 One bit memory cell, RS latch using NOR gates and NAND gates. 5.3 Flip flops - Clocked SR flip flop, Preset and Clear, J-K flipflop, D and T Flip Flop. 5.4 Propagation delay time and Race around condition, Master Slave J-K flip flop, Applications of flip flops. 5.5 Conversion of one type of flip flop to another type.	08
6. Counters & Shift Registers	6a. Compare given type of counters. 6b. Design of given counters using JK flipflop. 6c. Develop given counter using IC 7490. 6d. Classify given types of shift registers. 6e. Design given type of shift register.	6.1 Counters– Asynchronous (ripple) and synchronous counters. (Definition) 6.2 Design of asynchronous counters (UP and DOWN) using JK or T flip flop (up to 4 bit) 6.3 MOD -N Counter, Ring Counter, Johnson Counter, Decade counter IC 7490. 6.4 Shift registers – Logic diagram of 4-bit shift register, Definition and types of shift registers (SISO, SIPO, PISO, PIPO) 6.5 Bi-directional shift register, Universal Shift Register, Applications of shift register.	09
		Hrs	48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Pract i- cals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Design number system from 0 to 50 with base 7.	Digital system and Number systems	02
2	Identify different pins of logic gate IC, apply input, measure output and relate it with the truth table.	Logic gates & Boolean Algebra	02
3	Assemble various basic gates using universal gates and relate it with the truth table.		02
4	Assemble the logic circuit using AND/OR/NOT logic gates and NAND gates for verification of Boolean expression.		02
5	Assemble the logic circuit using AND/OR/NOT logic gates and NAND gates for verification of De-Morgan’s Theorem.		02
6	Assemble the logic circuit for half adder and full adder using logic gates and verify its truth table.	Combinational Logic Design	02
7	Identify different pins of 8:1 multiplexer IC, apply input, measure output and relate it with the truth table.	Multiplexers and Demultiplexers	02
8	Identify different pins of 1: 8 de multiplexer IC, apply input, measure output and relate it with the truth table.		02
9	Identify different pins of SR flip flop IC, apply input, measure output and relate it with the truth table.	Sequential Circuits	02
10	Identify different pins of SR flip flop IC, apply input, measure output and relate it with the truth table.		02
11	Identify different pins of D flip flop IC, apply input, measure output and relate it with the truth table.		02
12	Identify different pins of T flip flop IC, apply input, measure output and relate it with the truth table.		02
13	Assemble 4 bit synchronous counter using Flip Flop, show its output on LED and relate it with the truth table.	Counters & Shift Registers	02
14	Assemble decade counter using IC 7490, show its output on LED and relate it with the truth table.		02
15	Assemble 4 bit SISO register using flip flop, show its output on LED and relate it with the truth table. .		02
16	Assemble 4 bit PIPO register using flip flop, show its output on LED and relate it with the truth table.		02
Total Hrs			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Digital system and Number systems	02(02)	06(00)	00(00)	08(02)
2	Logic gates and Boolean Algebra	02(02)	03(03)	06(03)	11(08)
3	Combinational Logic Design	02(02)	03(06)	06(00)	11(08)
4	Multiplexers and Demultiplexers	02(00)	03(03)	03(03)	08(06)
5	Sequential Circuits	02(00)	03(03)	06(03)	11(06)
6	Counters and Shift Registers	02(00)	03(00)	06(06)	11(06)
	Total	12(06)	21(15)	27(15)	60(36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

T- Unit/Topic Number

L-Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Options
1	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	2	R	2	3	R	2										
2	1	U	3	1	U	3	2	U	3	2	U	3	2	A	3				3/5
3	3	U	3	4	U	3	5	U	3	3	U	3	3	U	3				3/5
4	6	U	3	2	A	3	2	A	3	4	U	3	5	U	3				3/5
5	3	A	3	3	A	3	4	A	3	4	A	3	5	A	3				3/5
6	5	A	6	6	A	6	6	A	6										2/3

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assign-ments	15	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	60	24	Theory Answer Scripts	1,2,3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assign-ments	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End of the Course	25	10	Practical Answer Scripts	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form		1, 2, 3, 4,5,6	
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Drawing circuit diagram, selection of equipment. writing procedure etc.	10
2	Performance	20
3	Calculation, Result, Drawing Graphs(if any)	10
4	Viva Voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	-	3	-	-	-	-	-	-
2	3	-	3	2	-	-	2	2	-
3	3	-	3	-	-	-	-	-	-
4	3	-	-	2	-	-	-	-	2
5	3	-	3	-	-	1	2	2	2
6	3	-	3	2	-	1	2	2	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Digital Integrated Electronics	Herbert Taub (Author), Donald L. Schilling, McGraw-Hill Inc, 1977	10: 0070857881 13: 9780070857889
2	Digital Principles and Application	Malvino, Albert Paul; Leach, Donald P., McGraw-Hill, 1986	10: 0070398836 13: 9780070398832
3	Modern Digital Electronics	R.P. Jain, McGraw Hill Education (India) Private Limited, 2009	10: 0070669112 13: 9780070669116
4	CMOS/TTL A user's guide with projects	Joseph J. Carr, TAB Books, 1st Edition, 1984	10: 0830616500 13: 9780830616503

❖ **E-REFERENCES:**

- <https://nptel.ac.in/courses/108105132>, accessed on 18th January 2022.
- <https://nptel.ac.in/courses/108105113>, accessed on 18th January 2022.
- https://www.youtube.com/watch?v=AT_GjUjNFpo, accessed on 18th January 2022.

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

- Digital Multi-Meter.
- Logic Gates ICs (7400,7402,7404,7408,7432,7486)
- Multiplexer and De multiplexer IC (74150,74151,74138,74139)
- Flip Flops ICs (7472,7474,74H71,74L71)
- Breadboard and LEDs.

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr.R.V.Yenkar	Head of Electronics & Telecomm Engineering	Government Polytechnic, Nagpur
2	Dr.V.H.Mankar	Head of Electronics & Telecomm Engineering	Government Polytechnic, Nagpur.
3	Mrs.J.A.Raut	Lecturer in Electronics	Government Polytechnic, Nagpur
4	Mrs.S.S.Pampattiwar	Lecturer in Electronics	Government Polytechnic, Nagpur
5	Mr.S.V.Darvhekar	Director, Beta Computronics Pvt. Ltd.,Nagpur	Beta Computronics Pvt. Ltd. Nagpur
6	Mrs.Gazala Ali	Head of Electronics & Telecomm Engineering	Ajuman Polytechnic, Nagpur.
7	Mr.K.S.Pachpor	Lecturer in Electronics	Government Polytechnic, Amravati.

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : DIPLOMA IN INFORMATION TECHNOLOGY/
COMPUTER ENGINEERING

COURSE CATEGORY: PROGRAMME CORE COURSE

COURSE CODE : IT251G

COURSE TITLE : WEB PAGE DESIGN

TEACHING SCHEME: TH: 00; TU: 00; PR: 04(CLOCK HRs.)

TOTAL CREDITS : 02 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)

TH. TEE EXAM : --

PR. TEE EXAM : 02 HRs

PT. EXAM : --

❖ **RATIONALE:**

It is estimated that across the Internet, over 100 million domain names are in use. With fast and cheap broadband Internet connections available to the masses, online users now are exceeding. Students will get acquainted with the current developments in web and Multimedia, which would be helpful in IT applications. It is a practical oriented course which will enable student to develop Web sites using HTML, CSS and JavaScript.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Design the web page using basic tags of HTML.
2. Use HTML tags for linking HTML documents.
3. Use table tag and formatting table tags to organize information in tabular form.
4. Design input forms using HTML form tag and different form controls.
5. Use Style sheets to gain full control of formatting within web pages.
6. Write and implement JavaScript in HTML documents. Develop the static website.

❖ **COURSE DETAILS:****A. THEORY : Nil****B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:**

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Design Web page with HTML using basic tags - <HTML>, <HEAD>, <TITLE>, <BODY> elements	1.Basic HTML Tags	02
2	Design Web page and apply some block level tags and some text level tags.		04
3	Design Web page using font Color, font face, font size, background color.		02
4	Write a code to create a web page including i) Ordered lists ii) Unordered list iii) Nesting list		02
5	Design Web page including links in a Web page. - Local page in same folder - Page in different folder - Page in web - Specified location within document	2.HTML Image tags and Hyper linking of text and images	04
6	Write a code to create a web page using Image tags with height and width and also Used for background image.		04
7	Design Web page Include images with different alignments and wrapped text in and also link the image in web page		04
8	Design table in web page using basic tables tags- <table>, <tr>, <td>, <th>.	3.HTML table tags	02
9	Write a code to create a web page using Table tags a)Using rowspan and colspan b)Background Image in a table		04
10	Write a code to create a web page using Table tags a)Create table of 3 rows and Columns b)Having border , border size, border color c) Image in a particular cell.		04
11	Write a code to create a web page using Form tag. Example:- Admission Form	4.HTML Forms	06
12	Apply in-line CSS to change colors of certain text portion, bold, underline and italics certain words in your HTML web page. Also change background color of each paragraph using in-line CSS.	5.HTML and Cascaded Style Sheets	04
13	Write a program to create menu using HTML and CSS.		04
14	Develop a simple JavaScript in HTML.	6 HTML and JavaScript	02
15	Write a program to print date using JavaScript.		02
16	Write a program to Sum and Multiply two numbers using JavaScript.		04

17	Write a code to Put validation checks on values entered by the user using JavaScript (such as age should be a value between 1 and 150).		04
18	Design a website of minimum 6 pages using HTML,CSS and JavaScript.		06
Total Hrs			64

❖ SPECIFICATION TABLE FOR THEORY PAPER:Nil

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:Nil



❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	-	--	Test Answer Scripts	-
		Class Room Assignments		Assignments	-	--	Assignment Book	-
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	Theory Answer Scripts	-
				Total	--	--		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End of the Course	50	20	Practical Answer Scripts	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form		1, 2, 3, 4,5,6	
	End of Course Survey			End of the Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Activities / Writing program	20
2	Performance / Execution of program	20
3	Viva Voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:IT**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	--	3	3	--	--	--	--	3
2	3	--	3	3	--	--	--	--	3
3	3	--	3	3	--	--	--	--	3
4	3	--	3	3	--	--	--	--	3
5	3	3	3	3	--	--	--	--	3
6	3	3	3	3	--	2	2	--	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:CM**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	--	3	3	--	--	--	3	--
2	3	--	3	3	--	--	--	3	--
3	3	--	3	3	--	--	--	3	--
4	3	--	3	3	--	--	--	3	--
5	3	3	3	3	--	--	--	3	--
6	3	3	3	3	--	2	2	3	--

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	HTML & CSS: The Complete Reference	Thomas Powell, McGraw Hill Publisher, Fifth Edition, 2010	13:9780070701946
2	HTML, CSS, and JavaScript All in One: Teach Yourself	Julie C. Meloni, Jennifer Kyrnin, 3 rd edition, Pearson Publisher, 2018	13: 9780672338083
3	Web Design	G.S. Baluja Tata McGraw Hill, New Delhi	10: 81-87522-178 13: 9788187522171

❖ **E-REFERENCES:**

1. <https://www.w3schools.com/html/> , accessed on 18th January 2021
2. <https://www.codecademy.com/learn/learn-html> , accessed on 18th January 2021
3. <https://www.learn-html.org/en/Links> , accessed on 18th January 2021

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

1. Computer (Dual CORE and above) with Internet connection.
2. Windows 7 or 8 or latest (Professional Edition/Academic edition)
3. Network printer.

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr. A.R.Mahajan	Head of Department (I.T.Dept.)	Chairman
2	Dr.M.V.Sarode	HOD, Computer Engineering	G.P.Nagpur
3	Mr. Dipak Dhote	Operations Manager, IT-Network Infosystems Pvt LTD	Industry Expert
4	Dr. Rakesh Kadu	Assistant Professor, I.T., Ramdeobaba College of Engg. and Management, Nagpur.	Member from Academics(External)
5	Mrs.V.A.Raje	Lecturer in C.O., G.P.Arvi	MSBTE Nominee
6	Mr.L.D.Vilhekar	Lecturer in Information Tech.	Member (Internal)
7	Mrs.D.P.Chanmanwar	Lecturer in Information Tech.	Member (Internal)), Course Expert
8	Mr. M.N.Gawande	Lecturer in Electrical Engg.	CDC In Charge and Member Secretary
9	Mrs.Isha Sangolkar	Lecturer in Information Tech.	Course Expert
10	Mrs.D.S.Nalinde	Lecturer in CM	Course Expert G.P.Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : DIPLOMA IN COMPUTER ENGINEERING
COURSE CATEGORY: PROGRAMME CORE COURSE
COURSE CODE : CM206G
COURSE TITLE : INFORMATION AND CYBER SECURITY
TEACHING SCHEME: TH:03; TU: 00;PR: 00 (CLOCK HRs.)
TOTAL CREDITS : 03 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM : 03 HRs
PR. TEE EXAM : -
PT. EXAM : 01 HR

❖ RATIONALE:

Information and Cyber security is becoming one of the most important and challenging areas of computing today. It is essential to understand various threats to secure computing information and Cyber Crime. After learning this course student will be able to recognize potential threats to confidentiality, integrity and availability also it will create awareness of IT Act and Cyber laws.

❖ COURSE OUTCOMES:

After completing this course students will be able to—

1. Analyze risks and attacks in IT environment.
2. Use Access control techniques for information security.
3. Apply Cryptographic techniques for data security.
4. Analyze Threats and Attacks in cyber security.
5. Identify and analyze challenges of digital forensics.
6. Inspect applicable Sections of IT act for Cybercrime scenario.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. Introduction to Information Security	1a. Classify information on the basis of given criteria. 1b. Describe Security Principles with justification. 1c. Analyze the risk in given problem of system. 1d. Identify the type of attack in a given web application.	1.1 Information, information classification by criteria, Need of Information. 1.2 Principles of Information security: Confidentiality Integrity Availability Accountability 1.3 Risk analysis: Threat, Viruses, Vulnerability, Risk and Counter Measure. 1.4 Types of attack: Active and passive attack, Denial of service, DDOS, backdoors and trapdoors, sniffing, spoofing, Man in the Middle, Encryption attack.	06
2. User Authentication and Access control	2a. Apply authentication technique in a given social networking site. 2b. Describe given Biometric Authentication with justification. 2c. Compare Access Control Models for given access role.	2.1 Authentication and Identification: User name and Password, Piggybacking, Shoulder surfing, Dumpster diving. 2.2 Biometrics: Finger Print, Hand print, Retina, Voice, Keystroke and signature patterns. 2.3 Access control Models: Discretionary Access Control (DAC), Role Based Access Control (RBAC), and Mandatory Access Control (MAC).	08
3. Introduction to Cryptography	3a. Describe given terminology of cryptography with example. 3b. Apply substitution technique to given problem. 3c. Use DES and AES algorithm for encryption. 3d. Illustrate given Asymmetric algorithm.	3.1 Terminologies: Plain text, Cipher text, Cryptography, Cryptanalysis, Cryptology, Encryption, Decryption. 3.2 Substitution techniques: Caesar cipher, Modified Caesar cipher, Transposition techniques. 3.3 Symmetric Cryptography: DES(Data Encryption Standard) and AES(Advanced Encryption Standard algorithm) 3.4 Asymmetric Cryptography: RSA and ECC	10
4. Introduction to Cyber Security	4a. Describe Cyber Security. 4b. Identify types of attack in given system. 4c. State which type of cybercrime occurred	4.1 Introduction: Cyber security Fundamentals. 4.2 Types of Cyber Attacks: Web based attack, System based attack, Volume based attack 4.3 Cyber Crime: Cyber stalking ,Forgery and counterfeiting, Cyber squatting	08

	based on given situation. 4d. Identify case studies of given cyber threats.	4.4 Cyber threats: Cyber warfare Cyber terrorism Cyber Espionage	
5. Cyber Crime and Cyber Forensics	5a. Describe given cyber-crime with example and justify. 5b. Compare various attacks mobile. 5c. Identify the challenges in Computer Forensics based on given problem.	5.1 Cybercrime: Wireless and mobile devices, Proliferation of mobile and wireless devices, Credit card Fraud in Mobile devices. 5.2 Attacks on Mobile devices 5.3 Cyber Forensics: Historical Background, Digital forensics science, Digital Forensics Lifecycle, Forensic Analysis of email. Challenges of computer forensics.	08
6. Cyber Space and Laws	6a. Identify names of cyberspace for social media. 6b. Illustrate need of Cyber Law. 6c. Identify the IT Act section applied to given Crime situation. 6d. Compare Block chain technology with other security.	6.1 Introduction to Cyber space, Indian Cyberspace, 6.2 Cyber Law, Cyber Security Policy. 6.3 Sections of IT act 2000 and Amendment Act 2008. 6.4 Introduction to Block chain.	08
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS: Nil

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Introduction to Information Security	02(02)	03(00)	00(00)	05(02)
2	User Authentication and Access control	02(02)	06(03)	06(03)	14(08)
3	Introduction to Cryptography	02(00)	06(03)	06(06)	14(09)
4	Introduction to Cyber Security	02(00)	03(03)	03(03)	08(06)
5	Cyber Crime and Cyber Forensics	02(00)	03(03)	03(03)	08(06)
6	Cyber Space and Laws	02(02)	03(03)	06(00)	11(05)
	Total	12(06)	24(15)	24(15)	60(36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

T- Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Options
1	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	2	R	2	6	R	2										
2	1	U	3	2	U	3	3	U	3	2	U	3	3	U	3				3/5
3	2	U	3	3	U	3	4	U	3	4	U	3	5	U	3				3/5
4	5	U	3	6	U	3	2	A	3	6	U	3	2	A	3				3/5
5	2	A	3	4	A	3	5	A	3	4	A	3	5	A	3				3/5
6	3	A	6	6	A	6	3	A	6										2/3

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	15	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	60	24	Theory Answer Scripts	1,2,3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	-	-	-	-
		Journal Writing		Assignments	-	-	-	-
				Total	-	-	-	-
	TEE (Term End Examination)	End Exam	Students	End of the Course	-	-	-	-
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form		1, 2, 3, 4,5,6	
	End of Course Survey			End of The Course	Questionnaires			

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	-	3	-	-	3	-	-	-	-
2	2	-	-	-	-	-	-	-	2
3	2	-	-	-	-	-	3	-	2
4	-	3	-	-	3	-	-	-	-
5	-	3	-	-	-	-	3	-	-
6	-	3	-	-	3	-	3	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Cryptography and Network Security	William Stallings, Pearson, Sixth Edition, 2014	978-93-325-1877-3
2	Computer Security	Dieter Gollman, Wiley Publication	978-0-470-74115-3
3	Cyber Laws and IT protection	Harish Chander, PHI publication, 2012	978-81-203-4570-6

❖ **E-REFERENCES:**

- https://www.tutorialspoint.com/information_security_cyber_law/index.htm accessed on 20th Dec 2021
- https://www.tutorialspoint.com/computer_security/index.htm accessed on 21st Dec 2021
- IT Act 2000 accessed on 25th Dec 2021
- IT Amendment Act 2008 accessed on 25th Dec 2021

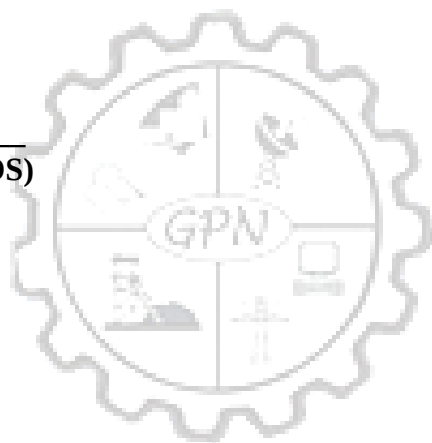
❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION :-**

Nil

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr.M.V.Sarode	Head of Department (Computer Engg.Dept.)	Government Polytechnic Nagpur
2	Mr.P.S.Thakre	Lecturer in Computer Engineering	Government Polytechnic Nagpur
3	Mrs.D.S.Nalinde	Lecturer in Computer Engineering	Government Polytechnic Nagpur
4	Mrs.C.R.Chaudhari	Lecturer in Computer Engineering	Government Polytechnic Nagpur
5	Mr.Dipak Dhote	Operations Manager,	IT-Network Infosystems Pvt LTD, Nagpur
6	Dr.Rakesh Kadu	Assistant Professor, I.T.	Ramdeobaba College of Engg, and Management, Nagpur.
7	Mrs.V.A.Raje	System Analyst	MSBTE,RO Nagpur

(Member Secretary PBOS)



(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN COMPUTER ENGINEERING
COURSE CATEGORY	: PROGRAMME CORE COURSE
COURSE CODE	: CM207G^{\$}
COURSE TITLE	: JAVA PROGRAMMING
TEACHING SCHEME	: TH:03; TU: 00;PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 04 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs
PT. EXAM	: 01 HR

❖ **RATIONALE:**

With the growth of Information and Communication Technology, there is a need to develop large and complex software. Further, those software should be platform independent, Internet enabled, easy to modify, secure, and robust. To meet this requirement object-oriented paradigm has been developed and based on this paradigm the Java programming language emerges as the best programming environment. Now, Java programming language is being used for mobile programming, Internet programming, and many other applications compatible to distributed systems. This course aims to cover the essential topics of Java programming so that the students can improve their skills to cope with the current demand of IT industries and solve many problems in their own field of studies.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Adopt the fundamentals of Java Programming for developing an application.
2. Apply basic features of OOP to design an application.
3. Develop program in java using Classes, Inheritance, Interfaces and Packages.
4. Employ Runtime Error Handling, Concurrent Programming practices to develop a Parallel Processing Application.
5. Use the Collection Framework classes and interfaces in java program.
6. Perform String Handling, Read and Write Operations using Console and File IO streams.

❖ **COURSE DETAILS:****A.THEORY**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs
1. Fundamentals of Java Programming	1a. Describe the given feature of java with its advantages. 1b. Write Java programs using given data types. 1c. Use Literals for given programming problem 1d. Identify scope and lifetime of a variable in the given program code. 1e. Construct the expressions using implicit and explicit type conversions to solve the given problem. 1f. Describe the function of given operator with example. 1g. Develop Java programs by implementing arrays for solving given programming problem. 1h. Develop Java programs using relevant control statement to solve the given problem. 1i. Use Command Line arguments to accept given inputs in Java program.	1.1 Java Evolution: History, Features, Java and the Internet, Advantages of Java, JVM, Byte code. 1.2 Data types: byte, short, int, long, float, double, char, Booleans 1.3 Literals: Integer, Floating-Point, Boolean, Character, String 1.4 Variables: Declaring a variable, Dynamic Initialization, Scope and Lifetime of variables 1.5 Type Conversion and Casting: Java's Automatic Conversions, Casting Incompatible Types, Automatic Type promotion in Expressions, The Type Promotion Rules 1.6 Types of Operators – Arithmetic Operators, Bitwise Operators, Relational Operators, Boolean Logical Operators, Assignment Operator, The ? Operator, Operator Precedence & Associativity, Mathematical Functions – min(),max(),sqrt(),pow(),exp(),round,abs() 1.7 Arrays – One Dimensional, Multidimensional 1.8 Control Statements: Selection Statements - if, switch, Iteration Statements - while, do-while, for, The For-Each Version of the Loop, Nested Loops, labelled loops, Jump Statements – break, continue 1.9 Use of command line arguments	06
2. Classes, Objects And Methods In Java	2a. Write program to create classes and objects for given problem. 2b. Describe the given Visibility Control with Example.	2.1 Class Fundamentals, Object creation, new keyword, reference variables 2.2 Visibility Control: public, private, protected, default 2.3 Introducing Methods, Parameterized Methods, varargs:	08

	2c. Use Methods for given programming problem. 2d. Use Constructors for given programming problem. 2e. Use static/this/final keyword in given programming problem. 2f. Describe the concept of Garbage collection in given program. 2g. Develop programs based on Vector Classes, Wrapper Classes, Nested and Inner Classes for given problem.	variable length arguments, Methods Returning a Value, Methods with Object as Parameter, Methods returning object, Method Overloading 2.4 Introducing Constructors, Types of Constructors, Parameterized Constructors, Constructor Overloading 2.5 Keywords: static, this, final 2.6 Garbage Collection 2.7 Use of :String class, String, Wrapper Classes, Vector Class, Nested and Inner Class	
3. Inheritance, Interface and Package	3a. Apply identified type of inheritance for given programming problem. 3b. Differentiate between overloading and overriding for the given example. 3c. Use the concept of abstract classes for given programming problem. 3d. Develop program using specified interface. 3e. Create user defined package for the given problem.	3.1 Inheritance: Inheritance Basics, Types of Inheritance, Member Access and Inheritance, Referencing Subclass Objects with Superclass Reference, Using super, Creating Multilevel Hierarchy, Constructor Invocation in Inheritance Multilevel Hierarchy 3.2 Method Overriding, Dynamic Method Dispatch, Applying Method Overriding, 3.3 Using Abstract Classes, Using final with Inheritance (to prevent Overriding and to prevent inheritance), static members 3.4 Interfaces: Defining an Interface, Implementing an Interface, Nested Interface, Applying Interfaces, Variables in Interfaces, Extending Interfaces, Interface References 3.5 Package: Defining a Package, Finding Packages and CLASSPATH, Access Protection, Importing Packages	10
4. Exception Handling, Multithreaded Programming	4a. Develop programs for handling the given exception. 4b. Create threads to run the given multiple processes in the given	4.1 Exception Handling: Exception Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch clauses, Nested try Statements, throw, throws,	08

	program.	finally, Java's Built-in Exceptions, Creating own Exception Subclasses, Chained Exceptions, Using Exceptions 4.2 Multithreaded Programming: Java Thread Model, Creating thread by extending Thread class and by implementing Runnable interface, Life Cycle of Thread, Main Thread, Creating Multiple Threads, Using <code>isAlive()</code> and <code>join()</code> , Thread Priorities, Inter-thread Communication, Suspending, Resuming and Stopping Threads.	
5. The Collections Framework	5a. Develop programs using given Collection classes. 5b. Use an Iterator for accessing given Collection. 5c. Develop programs using given Legacy classes and Interfaces in Collections Framework.	5.1 Collections overview, Collection Interfaces, The Collection classes- Array List, Linked List, Hash Set, Tree Set, Priority Queue, Array Deque 5.2 Accessing a Collection via an Iterator, Using an Iterator, The For-Each alternative, Map Interfaces and Classes, Comparators, Collection algorithms, Arrays 5.3 The Legacy Classes and Interfaces- Dictionary, Hashtable, Properties, Stack, Vector More Utility classes, String Tokenizer, Bit Set, Date, Calendar, Random, Formatter, Scanner.	08
6. String Handling, IO	6a. Develop java program to perform specified String operations on a given String. 6b. Use I/O stream classes in program to solve given problem.	6.1 String Handling: String constructors, Special String Operations, Character Extraction, String Comparison, Searching Strings, Modifying a String, String Buffer 6.2 IO: Files and Directories, I/O Classes and Interfaces, Byte Streams classes, Character Stream classes, Use of File class: reading/writing characters/bytes in a file, Input/ Output Exceptions, Serialization, Serialization Example	08
		Total	48

B.LIST OF PRACTICALS / LABORATORY EXPERIENCES / ASSIGNMENTS:

Practi-Cals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Setup a Java Programming Development Environment by using: a) Command Prompt (classpath and path setup) b) Any IDE(Eclipse,NetBeans etc.)	1. Fundamentals of Java Programming	02
2	Develop Programs to demonstrate Operators, Variables, Constant		02
3	Develop Programs to demonstrate use of control statements for branching and looping (if, switch, conditional if (? :), while, do-while, for)		02
4	Develop Programs to demonstrate Arrays(1D, 2D) , Command Line Arguments		02
5	Develop programs to demonstrate the concept of – a) Class b) Object c) Method (Parameterized Methods, Methods Returning a Value, Methods with Object as Parameter, Methods returning object) d) Method Overloading	2. Classes, Objects And Methods In Java	02
6	i) Develop programs to demonstrate the use of following keywords – a) static b) this c) final ii) Develop program to demonstrate the concept of Nested and Inner classes		02
7	i) Develop a program to implement different functions available in String Class ii) Develop program to implement Vector class, Wrapper class		02
8	i) Develop program to implement Single, Multilevel Inheritance ii) Develop program to implement Method Overriding	3. Inheritance, Interface and Package	02
9	i) Develop program to demonstrate the concept of Interface ii) Develop program to demonstrate the concept of abstract class and abstract method iii) Develop program to demonstrate the concept of Dynamic Method Dispatch		04
10	i) Develop program to demonstrate the concept of package ii) Develop program to demonstrate the concept of visibility control in inheritance and packages.		02
11	i) Develop a program for implementation of try,	4. Exception	02

	catch and finally ii) Develop a program for implementation of throw and throws	Handling, Multithreaded Programming	
12	Develop a program to implement concept of Multithreading		02
13	i) Develop programs using Array List ii) Develop program to use an iterator for accessing given Collection	5. The Collections Framework	02
14	Develop program to perform various String operations on a given String	6. String Handling, IO	02
15	i) Develop program for implementation of IO Stream classes ii) Develop program for implementation of File Stream classes		02
Total Hrs			32

❖ **SPECIFICATION TABLE FOR THEORY PAPER:**

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Fundamentals of Java Programming	02(02)	03(03)	03(00)	08(05)
2	Classes, Objects And Methods In Java	02(02)	03(03)	06(03)	11(08)
3	Inheritance, Interface and Package	02(00)	03(03)	06(03)	11(06)
4	Exception Handling, Multithreaded Programming	02(00)	03(03)	06(03)	11(06)
5	The Collections Framework	02(02)	03(00)	03(03)	08(05)
6	String Handling, IO	02(00)	03(00)	06(06)	11(06)
	Total	12(06)	18(12)	30(18)	60(36)

R – Remember

U – Understand

A – Analyze / Apply

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:**

T-Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Options
1	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	2	R	2	5	R	2										
2	1	U	3	1	A	3	2	U	3	1	U	3	2	U	3				3/5
3	2	A	3	2	A	3	3	U	3	3	A	3	4	U	3				3/5
4	6	U	3	5	U	3	5	A	3	2	A	3	3	U	3				3/5
5	4	U	3	6	A	3	6	A	3	4	A	3	5	A	3				3/5
6	3	A	6	4	A	6	6	A	6										2/3

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assign-ments	15	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	60	24	Theory Answer Scripts	1,2,3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assign-ments	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End of the Course	50	20	Practical Answer Scripts	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form		1, 2, 3, 4,5,6	
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Writing Logic of Program .	10
2	Program Execution	20
3	Error Debugging	10
4	Viva Voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	-	-	3	-	-	-	3	-
2	3	-	-	3	-	-	-	3	-
3	3	-	3	3	-	3	3	3	3
4	3	-	3	3	1	3	3	3	3
5	3	-	-	3	-	-	-	3	-
6	3	-	3	3	-	3	3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Java: The Complete Reference	Herbert Schildt, McGraw Hill, Eleventh edition, 2020	978-9390491629
2	Introduction to Java Programming	Y. Daniel Liang, PHI, 10th edition, 2013	978-0133761313
3	Head First Java	Kathy Sierra, Bert, Trisha Gee O'Reilly Media; 3rd edition, 2022	978-1491910771

❖ **E-REFERENCES:**

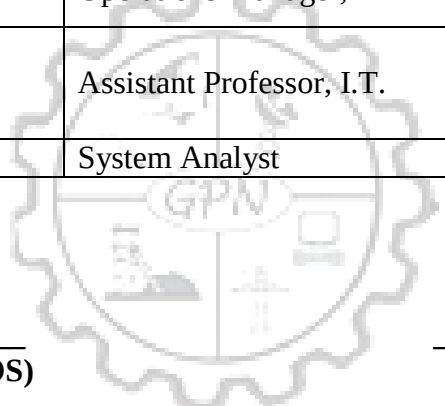
- <https://docs.oracle.com/javase/tutorial/> accessed on 4th August 2022
- <https://introcs.cs.princeton.edu/java/home/> accessed on 4th August 2022
- <https://docs.oracle.com/en/java/index.html> accessed on 4th August 2022
- <https://math.hws.edu/javanotes/> accessed on 4th August 2022

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

1. Processor requirements: minimum a Pentium 2 266 MHz processor.
2. Memory Requirements: On Windows 64-bit operating systems, in 32- or 64-bit mode, the Java runtime requires a minimum of 128MB of memory.

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr.M.V.Sarode	Head of Department (Computer Engg.Dept.)	Government Polytechnic Nagpur
2	Mr.S.A.Khatri	Lecturer in Computer Engineering	Government Polytechnic Nagpur
3	Mr.M.A.Rahman	Lecturer in Computer Engineering	Government Polytechnic Nagpur
4	Mr.A.A.Uike	Lecturer in Computer Engineering	Government Polytechnic Nagpur
5	Mr.Dipak Dhote	Operations Manager,	IT-Network Infosystems Pvt LTD, Nagpur
6	Dr.Rakesh Kadu	Assistant Professor, I.T.	Ramdeobaba College of Engg, and Management, Nagpur.
7	Mrs.V.A. Raje	System Analyst	MSBTE,RO Nagpur



(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN COMPUTER ENGINEERING
COURSE CATEGORY	: PROGRAMME CORE COURSE
COURSE CODE	: CM208G
COURSE TITLE	: MICROPROCESSORS
TEACHING SCHEME	: TH:03; TU: 00;PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 04 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT =2 CLOCK HR.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs
PT. EXAM	: 01 HR

❖ RATIONALE:

Microprocessor is the heart of embedded system and computers. This course will provide basic knowledge of microprocessor architecture and programming in assembly language. The student will be able to apply logics to various given problems and develop programs using assembly language construct that would help them to develop real time microprocessor based application programs.

❖ COURSE OUTCOMES:

After completing this course students will be able to—

1. Identify different type of microprocessor.
2. Identify functional block of 8086 microprocessor.
3. Use instruction set for different addressing modes.
4. Create foundation for assembly language Program.
5. Implement assembly language programs.
6. Execute assembly language programs using procedure and macro.

❖ COURSE DETAILS:

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. Basics of Microprocessor	1a. Classify the given type of microprocessor based on their characteristics. 1b. Compare Microprocessor with Microcomputers on given parameters. 1c. Demonstrate the need of multiprocessing and distributed processing for the given example. 1d. Identify the limitation of 8 bit microprocessor . 1e. Describe the given feature of 8086.	1.1 Concept of Microprocessor, Evolution of Microprocessor and its types. 1.2 Microprocessor and Microcomputers. 1.3 Multiprocessing and distributed processing. 1.4 Limitation of 8 bit microprocessor. 1.5 Introduction & Salient features of 8086.	06
2. 8086 - 16 bit Microprocessor	2a. Identify the different pins of 8086. 2b. Illustrate the use of given block in architecture of 8086. 2c. Demonstrate the concept of pipelining for related operation . 2d. Calculate the physical address for given segment of 8086.	2.1 Register organization:- General data registers, Segment Registers, Pointer and Index registers, Flag registers. Architecture of 8086: Functional block diagram, 2.2 Signal description of 8086 :- Pin Configuration of 8086 2.3 Concept of pipelining:- instruction pipelining. 2.4 Memory segmentation :- Non overlapped segments, Overlapped segments, Physical memory address generation.	10
3. 8086 Instruction Set Overview	3a. Identify the given types of instruction format. 3b. Classify the given types of addressing modes with example. 3c. Write the steps for fetching and execution for the given instruction. 3d. Describe the given instruction set of 8086 .	3.1 8086 instruction formats :- One byte Instructions, Register to Register, Register to/from Memory with no displacement, Register to/from Memory with displacement, Immediate Operand to Register, Immediate Operand to Memory with 16 –bit Displacement. 3.2 Addressing modes of 8086. :- Immediate, Direct, Register, Register Indirect, Indexed, Register Relative, Indexed, Based Indexed Relative Based Indexed. 3.3 Fetching and execution of an instruction. 3.4 Instruction set of 8086. Groups of Instruction: Arithmetic instruction, logical instruction, Data transfer instruction, Bit manipulation instructions, String operation	10

		instructions, Program control transfer or branching instructions, Process control instructions or Flag manipulation instructions .	
4. The Art of Assembly Language Programming (ALP)	4a. Write the program development steps for given problem. 4b. Describe the given tools of ALP. 4c. Use proper assembly directives and operators for given problem	4.1 Program development steps :- Defining problem, Writing Algorithms, Flowchart, Initialization checklist , Choosing instructions ,Converting algorithms to Assembly Language Programs. 4.2 Program Development Tools :- Editors, Assembler linker , Debugger. 4.3 Assembler directives and Operators.	06
5. 8086 Assembly Language Programming	5a. Use the given model of assembly language program for the given problem 5b. Design the relevant program for the given problem 5c. Apply relevant control loops in the program for the given problem 5d. Use string instructions for the given strings/block to manipulate it's elements.	5.1 Model of 8086 assembly language programs. 5.2 Programming using assemble Arithmetic operations on Hex and BCD numbers –Addition, Subtraction, Multiplication and Division. 5.3 Sum of Series , Smallest and Largest numbers from array , Sorting numbers in Ascending and Descending order , Finding ODD/EVEN numbers in the array , Finding Positive and Negative Numbers in array. 5.4 Block transfer ,String Operations - Length, Reverse the string.	10
6. Procedure and Macro	6a. Write the assembly language program using the relevant procedure for the given problem. 6b. Design the assembly language program using the relevant MACROS for the given problem.	6.1 Procedure - Defining Procedure - Directives used, FAR and NEAR - CALL and RET instructions. - Parameter passing methods. - Assembly Language Programs using Procedure. 6.2 Macro:- Defining Macros, MACRO and ENDM Directives ,Macro with parameters, Assembly language Programs using Macros.	06
		Total	48

B. LIST OF PRACTICALS / LABORATORY EXPERIENCES / ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Prepare a report on evolution of microprocessors and its types.	1.Basics of Microprocessor	02
2	To study Pin Diagram and Architecture of 8086 Microprocessor.	2. 16 bit Microprocessor	02
3	Develop and Execute assembly language program for i. addition of two 16 bit numbers ii. subtraction of two 16 bit numbers	3. 8086 Instruction set overview	02
4	Develop and Execute assembly language program to multiply two 16 bit unsigned/ signed numbers.		02
5	Develop and Execute assembly language program (a) compare two strings (b) find length of string (c) concatenate two string.		02
6	Develop and Execute assembly language program to perform block transfer data using string and without using string instruction.		04
7	Use Assembly Language Programming tools like Assembler ,linker, debugger, editor and functions.	4. The art of assembly language Programming	02
8	Develop and Execute assembly language program to find sum of series of numbers.	5.8086 Assembly Language Programming	02
9	Develop and Execute assembly language program to find smallest/ largest number from array of n numbers		02
10	Develop and Execute assembly language program to arrange numbers in array as ascending/ descending order		02
11	Develop and Execute assembly language program to convert Hex to Decimal, Decimal to Hex.		02
12	Develop and Execute assembly language program to check whether the given number is POSITIVE or NEGATIVE		02
13	Develop and Execute assembly language program i. to check whether the given number is ODD or EVEN ii.to find Odd/Even number from array of n numbers.		02
14	Develop and Execute assembly language program for finding larger of two numbers using procedure..	6. Procedure and Macro	02
15	Develop and Execute assembly language program to perform addition of two numbers by using macro.		02
Total Hrs			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Basics of Microprocessor	02(02)	03(00)	00(00)	05(02)
2	8086 - 16 bit Microprocessor	02(02)	03(03)	03(00)	08(05)
3	8086 Instruction set overview	02(00)	06(06)	06(03)	14(09)
4	The art of assembly language Programming	02(00)	06(03)	03(03)	11(06)
5	8086 Assembly Language Programming	02(02)	03(00)	06(06)	11(08)
6	Procedure and Macro	02(00)	03(03)	06(03)	11(06)
	Total	12(06)	24(15)	24(15)	60(36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

T-Unit/Topic Number

L-Level of Question

M-Marks

R-Remember

U-Understand

A-Analyze/ Apply

1R2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Options
1	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	2	R	2	5	R	2										
2	1	U	3	2	U	3	2	A	3	2	U	3	3	A	3				3/5
3	3	U	3	3	U	3	3	A	3	3	U	3	3	U	3				3/5
4	4	U	3	4	U	3	4	A	3	4	U	3	4	A	3				3/5
5	5	U	3	6	U	3	3	A	3	6	U	3	6	A	3				3/5
6	5	A	6	6	A	6	5	A	6										2/3

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	15	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	60	24	Theory Answer Scripts	1,2,3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End of the Course	50	20	Practical Answer Scripts	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form		1, 2, 3, 4,5,6	
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Execution of given program within time	10
2	Accurate output with justification	20
3	Debug , test and execute the programs.	10
4	Viva Voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	-	-	-	-	-	-	-	-
2	3	-	-	-	-	-	-	-	-
3	3	-	-	3	-	-	-	3	-
4	3	-	-	-	-	-	-	-	-
5	3	-	2	3	-	2	2	3	-
6	3	-	2	3	-	2	2	3	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Microprocessor and Interfacing (Programming and hardware)	Hall, Douglas V	13:9780070257429
2	Advanced Microprocessor & peripherals	K M Bhurchandi, A K Ray	978-1-25-900613-5 1-25-900613-1
3	The 8086 and 8088 Microprocessor	Triebel, Avtar Singh, Walter A	13:9780130930811
4	Advance Microprocessor and interfacing	Badri Ram, Tata McGraw-Hill Education, 12th Reprint, 2001	0070434484, 9780070434486

❖ **E-REFERENCES:**

- <https://www.tutorialspoint.com/microprocessor> accessed on 20/08/2022
- <http://www.eazynotes.com/pages/microprocessor/notes/block-diagram-of-intel-8086.html> accessed on 20/08/2022
- <https://www.elprocus.com/8086-assembly-language-programs-explanation> accessed on 20/08/2022

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

1. Operating System: Windows XP/Windows 7
2. Software: Editor: EDIT,NOTEPAD Assembler: TASM/MASM Linker: TLINK/LINK Debugger :TD/Debug of windows Operating System

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr.M.V.Sarode	HOD.,Computer Engineering	G.P.Nagpur
2	Mrs.D.S.Nalinde	Lecturer in CM	Course Expert G.P.Nagpur
3	Mrs.C.R.Chaudhari	Lecturer in CM	Course Reviewer G.P.Nagpur
4	Mr.S.A.Khatri	Lecturer in CM	Course Reviewer G.P.Nagpur
5	Mr.Dipak Dhote	Operations Manager,	IT-Network Infosystems Pvt LTD,Nagpur
6	Dr.Rakesh Kadu	Assistant Professor, I.T.	Ramdeobaba College of Engg, and Management, Nagpur
7	Mrs.V.A.Raje	System Analyst	MSBTE,RO Nagpur

 (Member Secretary PBOS)

 (Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN IT/CM/AIML
COURSE CATEGORY:	PROGRAMME CORE COURSE
COURSE CODE	: IT206G^{\$}
COURSE TITLE	: SOFTWARE ENGINEERING^{\$}
TEACHING SCHEME:	TH: 03; TU: 00; PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 04(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs
PT. EXAM	: 01 HR

❖ **RATIONALE:**

Software engineering is the foundation for professional processes to be followed involving principles, techniques and practices for software development. The course provides a framework for software professionals for building quality assured software products. It enables students to blend the domain specific knowledge with the programming skills to create quality software products also it is to develop methods and procedures for software development that can scale up for large systems and that can be used consistently to produce high-quality software efficiently

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Select suitable software model/process for software development.
2. Prepare software requirement specifications.
3. Develop Software schedule and model with realistic constraints.
4. Use concept of software modeling and data design in software development.
5. Estimate time, size and cost for software product.
6. Identify project management and quality assurance techniques in software development.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs
1. Software and Its Development Process	1a. State features of given Software process model. 1b. Describe Software process framework activity. 1c. Apply Selection criterion for software process model. 1d. Apply concepts of Agile Model for given scenario 1e. Select criterion for given software process.	1.1 Software Engineering – Definition of Software, Types of software, Nature of Software, Software engineering, software engineering as layered approach, Software Myth 1.2 General process Model- Software process framework Activity 1.3 Process Model- Waterfall Model, Incremental Model Spiral Model, Prototype Model, RAD Model 1.4 Agile Software Development: Agility, cost of change, Principles, Human Factors 1.5 Selection criterion for software process model, Project Management Concepts :4P's, W5HH principles,	08
2. Requirement Engineering	2a. Describe given term. 2b. Apply suitable software process for given scenario. 2c. Apply Requirement engineering technique for given scenario. 2d. Prepare SRS document for given scenario.	2.1 Software engineering practices, Core Principles , Software crisis, Software Process, 2.2 Software Process- Communication Practice, Planning Practice, Modeling Practice, Construction Practice, Deployment Practice (Statement and the meaning of each principle) 2.3 Requirement Engineering- Requirement gathering and analysis, Types of requirements (Functional Products, organizational, External Requirements) Eliciting requirements 2.4 SRS- Software Requirement Specification, Needs of SRS, Format , Characteristics	08
3. Scheduling and Modeling	3a. Solve given scheduling Problem. 3b. Develop given diagram related with requirement modeling for given scenario. 3c. Develop given diagram related with Flow Oriented Modeling for given scenario. 3d. Describe given term. 3e. Develop given diagram	3.1 Project Scheduling, Task set and Task network, Project Tracking- GANTT chart, Scheduling Techniques- PERT(Project Evaluation review Technique) CPM 3.2 Requirement Modeling Strategies, Data Modeling, Entity Relationship Diagrams (ER Diagram) 3.3 Flow Oriented Modeling – Data Flow Diagrams (DFD), Behavioral Modeling- Use case diagram, State Transition	10

	for given scenario.	Diagram. 3.4 Patterns - Patterns of requirement Modeling, Discovering analysis pattern, Requirement Pattern Example: Actuator-Sensor 3.5 Sequence Diagram, Activity Diagrams	
4. Modeling and Design	4a. Describe given terms. 4b. Identify design modeling concepts for given scenario. 4c. Identify Object Oriented Design Concepts for Given Scenario. 4d. Use given design element to design software for given Problem statement.	4.1 Design Process, Software quality guidelines for design, Software quality attributes, Evolution of software design, Design concepts 4.2 Design Modeling: Fundamental Design concepts (Abstraction, Information hiding, Structure, Modularity, Functional Independence, Architecture) 4.3 Object Oriented Design Concepts- Design Classes and Characteristics of design classes, Design Model, 4.4 Data design elements: Architectural Design Elements, Interface Design Elements, Component-Level Design Elements, Deployment- Level Design Elements	08
5. Project Metrics and Estimation	5a. Describe given terms. 5b. Compare given Metrics. 5c. Identify Metrics for given given scenario. 5d. Apply given Risk concept for given problem statement. 5e. Use given estimation techniques in given situation.	5.1 Metrics –Process Metrics, Project Metric 5.2 Software Measurements- Size oriented Metric, Function oriented Metric, 5.3 Metric for software quality, Metrics for small organizations 5.4 Software Risks-Risk Identification, Risk Projection, Risk Refinement, RMMM (Mitigation Monitoring, Management) 5.5 Estimation – Software scope, software feasibility, Resources, Software projects estimation, Decomposition techniques	08
6. Software Quality Assurance	6a. State given quality dimensions. 6b. Describe given term related with a Software quality Assurance. 6c. Identify need of given term for given scenario 6d. Identify the role of given phases of Software Quality	6.1 Quality Dimensions-Garvin's Quality Dimensions, Quality Factors-McCall's Quality Factors, ISO 9126 QUALITY FACTORS 6.2 Software quality Assurance (SQA)- Elements of SQA, Tasks of SQA, Goals of SQA, Formal Approach, Statistical Software quality assurance 6.3 Six Sigma For software engineering, Software reliability, Software safety,	06

	Assurance in given scenario.	THE ISO 9000 QUALITY STANDARDS 6.4 Phases of Software Quality Assurance- Planning, Phase, Activities Phase, Audit phase, review phase	
		Total Hrs.	48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Select suitable software development model for the given scenario.	1. Software and Its Development process	04
2	Identify functional and non-functional requirements for given scenario.	2. Requirement Engineering	02
3	Prepare Software Requirement Specification (SRS) document for the project. Consider any project to be developed in any technology as a Software Architect or Project Manager.		04
4	Develop USE case diagrams for given scenario.	3. Scheduling and Modeling	04
5	Develop E-R (Entity Relationship) diagram, DFD (Data Flow Diagram) for given system.		04
6	Develop a Sequence diagram for given problem statement.		04
7	Use Data Design Elements to develop design for given scenario. (Give any scenario).	4. Modeling and Design	02
8	Estimate time, size and cost for given software product.	5. Project Metrics and Estimation	04
9	Perform RMMM (Risk Monitoring Mitigation and Management) for given scenario.		02
10	Mini project to perform a case study on Software Quality Assurance techniques performed during different phases of a project for given scenario.	6. Software Quality Assurance	02
Total Hrs			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Software and Its Development process	02(02)	03(00)	06(03)	11(05)
2	Requirement Engineering	02(00)	03(03)	06(06)	11(09)
3	Scheduling and Modeling	02(00)	03(03)	09(06)	14(09)
4	Modeling and Design	02(02)	03(03)	03(00)	08(05)
5	Project Metrics and Estimation	02(00)	03(00)	06(06)	11(06)
6	Software Quality Assurance	02(02)	03(00)	00(00)	05(02)
	Total	12(06)	18(09)	30(21)	60(36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER

T- Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Options
1	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	4	R	2	6	R	2										
2	1	U	3	2	U	3	3	U	3	1	A	3	2	U	3				3/5
3	6	U	3	1	A	3	1	A	3	2	A	3	2	A	3				3/5
4	4	U	3	3	A	3	3	A	3	3	U	3	3	A	3				3/5
5	5	U	3	3	A	3	4	A	3	3	A	3	4	U	3				3/5
6	2	A	6	5	A	6	5	A	6										2/3

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	15	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	60	24	Theory Answer Scripts	1,2,3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End of the Course	50	20	Practical Answer Scripts	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form		1, 2, 3, 4,5,6	
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Drawing needful diagram, selection of suitable development model. writing procedure etc.	10
2	Performance	20
3	Identify the various elicitation techniques, identify design principles, Draw sequence, state, E-R diagram, DFD, Sequence and Activity diagram.	10
4	Viva Voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:
INFORMATION TECHNOLOGY**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	2	3	-	-	2	-	-	2
2	3	2	3	-	-	2	-	-	2
3	3	2	3	-	-	2	-	-	2
4	3	2	-	2	-	2	-	-	2
5	3	2	-	2	-	2	-	-	2
6	3	2	-	2	-	2	-	-	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:
COMPUTER ENGINEERING**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	2	3	-	-	2	-	2	-
2	3	2	3	-	-	2	-	2	-
3	3	2	3	-	-	2	-	2	-
4	3	2	-	2	-	2	-	2	-
5	3	2	-	2	-	2	-	2	-
6	3	2	-	2	-	2	-	2	-

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Project Management: Engineering, Technology and Implementation	Shtub, A. Bard, J. F. and Globerson, S, Prentice Hall,	0-13-102765-4
2	Software Engineering – a practitioner's approach	Roger S. Pressman, Tata McGraw Hill Publication, Seventh, 2010	978-0-07-337597-7
3	Software Engineering – Principles and Practice	Waman S. Jawadekar, Tata McGraw Hill Publication, 2004	10: 0070583714 13: 9780070583719

❖ **E-REFERENCES:**

- https://www.youtube.com/watch?v=Ln_LP7c23WM&list=PLbRMhDVUMngf8oZR3DpKMvYhZKga90JVt as accessed on 28th January 2022
- http://www.tutorialspoint.com/software_engineering/software_engineering_tutorial.pdf, accessed on 28th January 2022
- http://www.resource.mitfiles.com/IT/II%20year/IV%20sem/Software%20Engineering/books/Pressman__Software_Engineering.pdf, accessed on 28th January 2022
- https://www.tutorialspoint.com/software_engineering/software_project_management.html, accessed on 28th January 2022

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

Nil

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr. A.R.Mahajan	Head of Department (I.T.Dept.)	Government Polytechnic, Nagpur.
2	Dr.M.V.Sarode	Head of Department (CM DEPT)	Government Polytechnic, Nagpur
3	Mr.L.L.Bhadekar	Lecturer in IT	Government Polytechnic, Nagpur.
4	Mr.M.A.Rahman	Lecturer in CM	Government Polytechnic, Nagpur.
5	Mr. Dipak Dhote, Industry Expert	Operations Manager, IT-Network InfosystemsPvt LTD	IT-Network InfosystemsPvt LTD
6	Dr. Rakesh Kadu, Member from Academics(External)	Assistant Professor, I.T., Ramdeobaba College of Engg, and Management, Nagpur.	Ramdeobaba College of Engg, and Management, Nagpur.
7	Mrs.V.A.Raje, MSBTE Nominee	Lecturer in C.O., G.P.Arvi	G.P.Arvi
8	Mr. L.D.Vilhekar, Member (Internal)	Lecturer in Information Tech.	Government Polytechnic, Nagpur.
9	Mrs.D.P.Chanmanwar, Member (Internal)	Lecturer in Information Tech.	Government Polytechnic, Nagpur.
10	Mr. M.N.Gawande, CDC In Charge and Member Secretary	Lecturer in Electrical Engg.	Government Polytechnic, Nagpur.

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : **DIPLOMA IN COMPUTER ENGINEERING**
COURSE CATEGORY: **PROGRAMME ELECTIVE COURSE**
COURSE CODE : **CM210G \$**
COURSE TITLE : **DATA WAREHOUSE AND MINING**
TEACHING SCHEME: **TH:03 TU: 00;PR: 02(CLOCK HRs.)**
TOTAL CREDITS : **04 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT =2 CLOCK HR.)**
TH. TEE EXAM : **03 HRs**
PR. TEE EXAM : **02 HRs**
PT. EXAM : **01 HR**

❖ **RATIONALE:**

Data mining and warehousing are the essential components of decision support system for the modern days in industry and business. These techniques enable student to take better and faster decisions. The objective of this course is to introduce student to various data mining and data warehousing concept and techniques. This course introduces principles, algorithm, architecture, design and implementation of data mining and data warehousing techniques. Learning this course would improve the employment potential of student in the information management sector.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Identify scope and necessity of data warehousing for various applications.
2. Apply OLAP operation on data warehouse.
3. Use architecture for warehouse applications.
4. Apply data preprocessing cleaning techniques of data mining.
5. Implement data mining algorithms for different data sets
6. Implement Clustering algorithm for data analysis.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs
1. Introduction to Data Warehousing	1a. Compare the given database on the given parameters. 1b. Classify the given models of data warehouse. 1c. Identify the operation performed on database.	1.1 Data warehousing, Difference between Operational Database System and data warehouse, Need for data warehousing 1.2 Data Warehouse Models: Enterprise Warehouse, Data Mart, and Virtual Warehouse. 1.3 Extraction, Transformation, and Loading, Metadata Repository, benefits of data warehousing.	04
2. Data Warehouse Modeling and Online Analytical Processing I	2a. Interpret Data cube for the given data warehouse. 2b. Compare the given models of data warehouse. 2c. Illustrate the need of OLAP in data warehouse. 2d. Solve the given OLAP operations for given data.	2.1 Data Warehouse Modeling: Data cube and OLAP, Data cube: A multidimensional Data Model. 2.2 Stars, Snowflakes, and Fact Constellations, Examples of stars, snowflake and fact constellations. 2.3 OLAP: Need of OLAP, OLAP Guidelines 2.4 Typical OLAP Operations: roll up, drill down, slice & dice, rotate.	08
3. Data Warehouse Modeling and Online Analytical Processing II	3a. Select the different factors for design process of the given Data Warehouse. 3b. Illustrate the given warehouse architecture. 3c. Relate Bitmap and join Index for the given OLAP. 3d. Compare the given OLAP Architecture.	3.1 Data Warehouse Architecture: A Business Analysis Framework for Data Warehouse Design, Data Warehouse Design Process 3.2 A Three Tier Data Warehouse Architecture. 3.3 Indexing OLAP Data: Bitmap and join Index, Efficient Processing of OLAP Queries 3.4 OLAP Server Architectures :ROLAP Versus MOLAP Versus HOLAP.	08
4. Introduction to Data Mining	4a. Illustrate the given steps in KDD. 4b. Compare the major issues in database for mining process. 4c. Classify the given data objects and attributes types. 4d. Choose methods of data preprocessing for the given data.	4.1 Introduction to Data Mining: Mining Steps in the process of knowledge discovery of database(KDD). 4.2 Kind of data can be mined: database data, data warehouses, transactional data, Major issues in data mining: mining methodologies, user interaction, efficiency & scalability, 4.3 Data Objects and Attributes types:	08

	4e. Illustrate terminologies in data cleaning process.	nominal, binary, ordinal , numeric. 4.4 Data Preprocessing: Preprocess the data, Major Tasks in Data 4.5 Data Cleaning: Missing values, Noisy data, Data cleaning as a process.	
5. Mining Frequent Pattern and Mining Application	5a. Describe the given patterns in the database for mining. 5b. Choose association rules based on the given problem. 5c. Select the given mining application for problem solving based on situation.	5.1 Mining Frequent Patterns: Basic Concept: Market Basket Analysis, Frequent Item sets, Closed Item sets, and Association Rules 5.2 Frequent Item sets mining method: Apriori algorithm-finding frequent itemset using candidate generation. 5.3 Data mining application: Housing loan repayment prediction case study, Mortgage Loan Delinquency prediction, Crime Detection	10
6. Clustering Algorithm and Techniques	6a. Compare the given algorithm. 6b. Make use of given clustering algorithm for problem statement. 6c. Apply the given algorithm for problem statement. 6d. Make use of given algorithm for problem statement.	6.1 Introduction to Cluster Analysis, Clustering Paradigms: Hierarchical Vs. Partitioning, Numeric Vs Categorical 6.2 Partitioning Algorithm (k-means) 6.3 K-Medoid Algorithm: PAM 6.4 Clara algorithm, CLARANS algorithm	10
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Prepare a report on comparison of Enterprise warehouse, Data Mart and virtual warehouse model.	1.Introduction to Data Warehousing	02
2	Develop an application for OLAP and its operations: roll-up, drill down	2.Data Warehouse Modeling and Online Analytical Processing I	02
3	Develop an application for OLAP and its operations: slice and dice		04
4	Install Data Mining Tool WEKA. Study the GUI explorer on WEKA	4.Introduction to Data Mining	02
5	Implement Data cleaning technique I (Data Preprocessing—Finding and replacing missing value in sample Dataset)		04
6	Implement Data cleaning technique II (Data Transformation—Finding and replacing missing value in sample Dataset)		04
7	Demonstration of preprocessing on dataset		02

	Customer.arff		
8	Perform Association technique on Customer Dataset I.(Implementing Apriori Algorithm on customer dataset)	5.Mining Frequent Pattern and Mining Application	04
9	Apply clustering technique on customer dataset I.(Using K-means clustering on sample customer dataset.)	6. Clustering algorithm and Techniques	04
10	Apply clustering technique on customer dataset II.(Using K-means clustering on sample weather dataset.)		04
Total Hrs			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Introduction to Data Warehousing	02(02)	00(00)	00(00)	02(02)
2	Data Warehouse Modeling and Online Analytical Processing I	02(02)	06(03)	03(00)	11(05)
3	Data Warehouse Modeling and Online Analytical Processing II	02(02)	06(03)	03(03)	11(08)
4	Introduction to Data Mining	02(00)	03(03)	06(03)	11(06)
5	Mining Frequent Pattern and Mining Application	02(00)	06(03)	06(06)	14(09)
6	Techniques and clustering algorithm	02(00)	03(03)	06(03)	11(06)
	Total	12(06)	24(15)	24(15)	60(36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

T- Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Options
1	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	2	R	2	3	R	2										
2	2	U	3	2	A	3	2	U	3	2	U	3	3	U	3				3/5
3	3	U	3	3	U	3	3	A	3	3	A	3	4	U	3				3/5
4	4	U	3	5	U	3	5	U	3	5	U	3	4	A	3				3/5
5	6	U	3	4	A	3	4	A	3	6	U	3	6	A	3				3/5
6	6	A	6	5	A	6	5	A	6										2/3

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assign-ments	15	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	60	24	Theory Answer Scripts	1,2,3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assign-ments	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End of the Course	50	20	Practical Answer Scripts	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Correctness of implementation of algorithm	10
2	Analysis and implementation ability	20
3	Submit report in time	10
4	Viva Voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes(PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	-	-	-	-	-	-	-	-
2	3	-	-	3	-	-	-	3	-
3	3	-	-	-	-	-	3	-	-
4	3	-	3	3	-	-	-	3	-
5	3	-	3	3	-	2	3	3	2
6	3	-	3	3	-	2	3	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Data Mining concepts and Techniques	J.Hahn and Micheline Kamber, The Morgan Kaufmann Series in Data Management Systems	13: 978-1-55860-901-3
2	Data Mining Techniques	Arun K.Pujari, Universities Press, 2001	978-9-386-23505-3
3	Data Warehouse life cycle toolkit (J.Wiley)	R. Kimball, John Wiley Third Edition	978-0-471-20024-6
4	Data Based Management	Dr.Rajendra Kawle, Devraj publication	978-93-86492-00-5

❖ **E-REFERENCES:**

- <https://www.analyticsvidhya.com/learning-paths-data-science-buisness-analytics-buisness-intelligence-big-data/weka-gui-learn-machine-learning/> accessed on 2/8/2022
- <https://www.guru99.com/online-analytical-processing-html> accessed on 2/8/2022
- https://www.tutorialspoint.com/dwh/dwh_relational_olap.htm accessed on 2/8/2022
- <https://www.tutorialride.com/big-data-analytics/stream-cluster-analysis.htm> accessed on 2/8/2022
- <https://www.datamining365.com/2020/03/partitional-clustering-k-means.html> accessed on 2/8/2022

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

1. Computer System with basic configuration
2. Oracle Client and Server
3. Data Mining Tool: WEKA
4. Variable Inductor

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr.M.V.Sarode	HoD, Computer Engg.Deptt.	Government Polytechnic, Nagpur.
2	Mrs.C.R.Chaudhari	Lecturer	Government Polytechnic, Nagpur
3	Mr.S.A.Khatri	Lecturer	Government Polytechnic, Nagpur
4	Mrs.D.S.Nalinde	Lecturer	Government Polytechnic, Nagpur
5	Mr.Dipak Dhote	Operations Manager	IT-Network InfosystemsPvtLTD,Nagpur
6	Dr.Rakesh Kadu	Assistant Professor, I.T.	Ramdeobaba College of Engg, and Management, Nagpur.
7	Mrs.V.A.Raje	System Analyst	MSBTE,RO Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN COMPUTER ENGINEERING
COURSE CATEGORY:	PROGRAMME CORE COURSE
COURSE CODE	: CM211G
COURSE TITLE	: DIGITAL MARKETING
TEACHING SCHEME:	TH:03 TU: 00;PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 04(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs
PT. EXAM	: 01 HR

❖ RATIONALE:

Digital marketing is advertising and promotion of products and services using digital platform. Digital Marketing is rapidly evolving technology. Social media is ever growing marketing platform for users. The course will help student to improve skills to market their product or service in the digital media. The course will enable students to explore and create something new who wants to be a good entrepreneur or good professional in design and development

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Identify scope & necessity of digital marketing for various applications.
2. Interpret role of segmentation, Targeting and Positioning (STP) in digital marketing.
3. Use of Search Engine Optimization (SEO) for carrying out digital marketing
4. Analyze Search engine marketing in context of digital marketing.
5. Design digital media campaign using appropriate mix of Face book and Twitter.
6. Identify Web Analytic tool for different application.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs
1. Digital Marketing and its Role in Global Context	1a. Describe role and importance of digital marketing. 1b. Compare E-business & E-commerce on given points. 1c. Illustrate digital marketing concept with the types of marketing.	1.1 Evaluation of digital marketing: from traditional to modern marketing, premise of traditional marketing, Factors Impacting the Shift from Traditional to Modern Marketing, Advent of Modern Marketing Techniques. 1.2 Growth of 'E' Concepts: from E-Business to Advanced E-Commerce, Understanding E-Models, difference between E-Business & E-commerce 1.3 Digital Marketing: an Introduction, Emergence of Digital Marketing as a Tool, Pull and Push Marketing, digital Marketing Applications and Benefits.	04
2. Segmentation, Targeting and Positioning in Digital Marketing	2a. Interpret need of segmentation. 2b. Classify the given types of segmentation on the given criteria. 2c. Apply different marketing strategy based on condition. 2d. Describe the overview of Positioning in marketing context. 2e. Identify the benefits of positioning.	2.1 Segmentation: Concept, need and benefits of segmentation. 2.2 Criteria for segmenting digital Audience-geographic, demographic, psychographic behavioral segmentation 2.3 Targeting definition, Various target marketing strategies: mass marketing, segment marketing, niche marketing, micro marketing, local marketing 2.4 Positioning: definition of positioning in marketing, Types of positioning in marketing: pricing, quality, differentiation, convenience, customer service, user group. 2.5 Benefits of positioning in marketing: Create a strong competitive position, improve sales, define a target market, make more effective decisions, and connect to customer need.	08
3. Search Engine Optimizatio	3a. Describe given terms related to SEO. 3b. Select the given suitable method for given web	3.1 Introduction to SEO concept and role in digital marketing Understanding search engine optimization, common SEO	08

n (SEO)	page analysis in SEO. 3c. Make use of different tags in Search Engine Design in given example.	techniques , content creation as SEO technique, SEO as marketing strategy 3.2 Understanding search engine: search engine working, interaction of people with search engine, search engine marketing: keyword analysis, site popularity, web analytic & HTML tools, sponsored results. 3.3 Search engine site design & development: indexable content, title tags, meta tags, link structure, Nofollow links, keyword usage, URL structure.	
4. Search Engine Marketing (SEM)	4a. Describe given terminologies in Social Media Marketing. 4b. Choose the given type of advertising tool for given product. 4c. Write the steps for creating given adword account.	4.1 Search Engine Marketing: concept of search engine marketing, terminology associated to SEM, Pay per click (PPC), Cost per click (CPC), Search engine result Page (SERP), Cost per mile (CPM), Landing page, SEO Vs PPC, Pay per click. 4.2 Search engine advertising: Google Adwords, Bing Ads, Google search, google partners, google display network, campaign subtypes, specialized campaign subtypes: dynamic search ads, mobile apps, remarketing, engagement 4.3 Google Adwords account setting: account access, linked accounts, notification setting, preferences Google AdWord account structure: Account, campaign, Ad group	10
5. Social Media Marketing (SMM)	5a. Compare the given social media websites on the given points. 5b. Write steps for creating given page. 5c. Make use of the terms used in twitter advertising. 5d. Illustrate the concept of Blogging.	5.1 Introduction to Social Media marketing, types of social media websites, mobile social media 5.2 Facebook : creating a facebook page, creating a facebook group 5.3 Twitter Advertising: Use hashtags, retweet, follow and get followed, LinkedIn, 5.4 Blogging: Types of blogs, blogging platforms, blogging recommendations, advertising on facebook, advertising on youtube	08
6. Web Analytic	6a. Describe history of web analytic. 6b. List the terminologies in	6.1 Understanding Web Analytics: Web Analytics, purpose of web analytics, history of web analytics	10

	web analytic. 6c. Apply given tool based on the problem statement. 6d. Make use of given tool for problem statement.	6.2 Using Web Analytics: Web analytic basic, five Whs of web analytic, most used terms metrics, hits, user session, page tracking , page tagging. 6.3 Web analytic tool: criteria to choose web analytic tool, need ,features, cost, ability to integrate,super reliability, language and documentation support, Web Analytic tools: Woopra, Spring metrics, clicky, crazy Egg, user testing 6.4 Google Analytic: concept of Google Analytic, need of Google Analytic, how to set up a free Google account,	
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Prepare a report of a sample website with strategic flow for e-commerce/publication etc. with the use of: HTML, CSS, Javascript	1. Digital Marketing and its role in global context	02
2	Apply role of STP for marketing of any product and prepare a detail report on it.	2. Applying segmentation, Targeting and Positioning to Digital Marketing	02
3	Create account on Google Analytics or any other analytics tool	3. Search Engine Optimization	04
4	Create the tracking id for web site and track links using Google Analytics tool		02
5	Analyze web site traffic and leads using Analytics tool		02
6	Prepare report on Search Engine Optimization (SEO) using Digital Marketing Platform		02
7	Demonstrate and install any Google Analytics plugin for the website	4. Search Engine Marketing	04
8	Use marketing features of any social media websites (eg. Facebook, Instagram .etc)	5. Social Media Marketing	02
9	Implement following using Google Analytics : 1. Content marketing	6. Web Analytic	04

	2. Website content optimization.		
10	Generate different type of reports through Google Analytic		04
11	Analyze data using Google Analytics		04
Total Hrs			32

❖ **SPECIFICATION TABLE FOR THEORY PAPER:**

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Digital Marketing and its role in global context	02(02)	03(00)	00(00)	05(02)
2	Applying segmentation, Targeting and Positioning to Digital Marketing	02(02)	03(03)	03(00)	08(05)
3	Search Engine Optimization (SEO)	02(00)	06(03)	03(03)	11(06)
4	Search Engine Marketing (SEM)	02(00)	03(03)	06(03)	11(06)
5	Social Media Marketing (SMM)	02(02)	06(00)	06(06)	14(08)
6	Web Analytic	02(00)	03(06)	06(03)	11(09)
	Total	12(06)	24(15)	24(15)	60(36)

R – Remember

U – Understand

A – Analyze / Apply

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:**

T-Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Options
1	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	2	R	2	5	R	2										
2	1	U	3	2	U	3	2	A	3	2	U	3	3	A	3				3/5
3	3	U	3	3	A	3	3	U	3	3	U	3	4	A	3				3/5
4	4	U	3	5	U	3	5	U	3	6	A	3	4	U	3				3/5
5	6	U	3	6	A	3	6	A	3	6	U	3	6	U	3				3/5
6	4	A	6	5	A	6	5	A	6										2/3

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	15	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	60	24	Theory Answer Scripts	1,2,3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End of the Course	50	20	Practical Answer Scripts	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Study of web pages and web site.	10
2	Installing and setting up a tool for web site	20
3	Interpretation of reports, result and conclusion	10
4	Viva Voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes(PSOs)	
	1	2	3	4	5	6	7	1	2
1	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	3	-	-
3	3	-	-	3	-	-	3	-	-
4	-	-	-	3	2	2	3	-	-
5	-	-	-	-	2	2	-	-	2
6	3	-	-	3	-	-	-	-	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Fundamentals of Digital Marketing	Puneet Singh Bhatiya, Pearson publication	978-93-325-8737-3
2	SEO for Dummies	Peter Kent	
3	Digital Marketing All in One for Dummies	Ryan Deiss	978-1-119-56023-4
4	Internet Marketing Pearson Education	Dave Chaffey, Kevin Johnston, Richard Mayer	9788131725191
5	Social Media Marketing All in One for Dummies	Jan Zimmerman and Deboarh	978-1-119-69687-2

❖ **E-REFERENCES:**

- <http://www.smartinsights.com/digital-marketing-strategy/customer-segmentation-targeting/segmentation-targeting-and-positioning> accessed on 2/8/2022
- https://www.emarketinginstitute.org/free-ebooks/#google_vignette accessed on 2/8/2022
- <https://firstsiteguide.com/google-analytics-for-wordpress/> accessed on 2/8/2022
- <https://www.mageplaza.com/blog/positioning-in-marketing.html> accessed on 2/8/2022

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

1. Web browser
2. Any Web Server(Tomcat)
3. Google Analytics

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr.M.V.Sarode	HoD, Computer Engg.Deptt.	Government Polytechnic, Nagpur.
2	Mrs.C.R.Chaudhari	Lecturer	Government Polytechnic, Nagpur
3	Mr.S.A.Khatri	Lecturer	Government Polytechnic, Nagpur
4	Mrs.D.S.Nalinde	Lecturer	Government Polytechnic, Nagpur
5	Mr.Dipak Dhote	Operations Manager	IT-Network Infosystems Pvt LTD, Nagpur
6	Dr.Rakesh Kadu	Assistant Professor, I.T.	Ramdeobaba College of Engg, and Management, Nagpur.
7	Mrs.V.A. Raje	System Analyst	MSBTE,RO Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN COMPUTER ENGINEERING
COURSE CATEGORY	: PROGRAMME CORE COURSE
COURSE CODE	: CM251G
COURSE TITLE	: WEB PROGRAMMING USING PHP
TEACHING SCHEME	: TH: 00; TU: 00; PR: 04 (CLOCK HRs.)
TOTAL CREDITS	: 02 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: -
PR. TEE EXAM	: 02 HRs
PT. EXAM	: -

❖ **RATIONALE:**

In the growing field of Web technology it is essential for every Diploma Engineers to learn PHP Language to help them build large and complex web applications. PHP can be used in three Primary ways: for server side scripting, for command line scripting and to develop client side GUI applications. After learning this course students will be able to design, develop and host web based application using PHP.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Develop program in PHP using control and looping statements.
2. Apply object-oriented concepts in programming.
3. Design web pages in PHP with validations.
4. Apply Session and Cookies concepts in PHP programming.
5. Implement database operations in PHP programming.
6. Apply File operations in PHP programming.

❖ **COURSE DETAILS:**

A. THEORY : NIL

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Install & run sample PHP program.	Introduction to PHP	02
2	Write a program to demonstrate Control statements -if else, while loop and switch case, etc.		02
3	Write a program to demonstrate various looping statements.		04
4	Write a program to implement Simple and Parameterized functions.	Programming Principles in PHP and OOP concepts	02
5	Write a program to demonstrate various array functions.		04
6	Write a program to demonstrate use of various PHP built-in string functions.		04
7	Create and execute PHP script for Error-handling using exceptions		04
8	Write a program to demonstrate inheritance of using object oriented paradigm		02
9	Write a program to demonstrate use of constructor.		02
10	Design a simple web page using following form controls a. Text box b. Radio button c. Check box d. Buttons	Working with data and Forms	04
11	Design a web page in PHP using Textbox control and demonstrate validation of data.		04
12	Write a program to demonstrate Passing variables with Session.	Use of session and Cookies	02
13	Write a program to demonstrate Passing variables with Cookies.		02
14	Write a program to send and receive email.		02
15	Create and execute a program to keep track of how many times a visitor has loaded the page		04
16	Develop an application to connect with database and retrieve data.	Database operations	02
17	Develop PHP-database application using database connectivity and perform operation of update, delete data from database.		02
18	Create and execute a PHP script for reading and writing a file.	Working with file system	02
19	Create report in Doc file with image using graphic concept.		02
20	Create and execute a PHP script for creating and deleting a file		02
21	Develop and host any PHP web based application.	Mini-project	10
Total Hrs.			64

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	-	-	-	-
		Class Room Assignments		Assignments	-	-	-	-
	TEE (Term End Examination)	End Exam	Students	End of the Course	-	-	-	-
				Total	-	-		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End of the Course	50	20	Practical Answer Scripts	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Writing program, Logic of the program	10
2	Handling tool and Debugging ability	10
3	Execution of program, Program Output, Complexity of program	20
4	Viva Voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	-	-	3	3	-	-	-	2	3
2	3	3	3	3	-	-	3	-	3
3	-		3	3	-	-	-	2	3
4	3	-	-	3	-	-	3	-	3
5	-	3	3	3	-	-	-	2	3
6	3	-	-	3	-	-	3	-	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Programming PHP	Ramsus Lerdorf, Kevin and Peter, O'Reilly, USA	978-1-449-39277-2
2	The Complete Reference PHP	Holzner, Steven Third edition	9780070223622
3	Advanced Web Technology	Dr Rajendra Kawle, Devraj Publication	978-93-86492-01-2

❖ **E-REFERENCES:**

- <https://www.tutorialspoint.com/php/> , accessed on Dec 2021
- <http://www.phpgurukul.com> , accessed on 18th January 2022

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

1. Computer System with latest configuration
2. Multimedia Projector
3. Software- Wamp/Xampp Server, Text Editor

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr.M.V.Sarode	Head of Department (Computer Engg.Dept.)	Government Polytechnic Nagpur
2	Mr.P.S.Thakre	Lecturer in Computer Engineering	Government Polytechnic Nagpur
3	Mrs.D.S.Nalinde	Lecturer in Computer Engineering	Government Polytechnic Nagpur
4	Mrs.C.R.Chaudhari	Lecturer in Computer Engineering	Government Polytechnic Nagpur
5	Mr.Dipak Dhote	Operations Manager,	IT-Network Infosystems Pvt LTD, Nagpur
6	Dr.Rakesh Kadu	Assistant Professor, I.T.	Ramdeobaba College of Engg, and Management, Nagpur.
7	Mrs.V.A.Raje	System Analyst	MSBTE,RO Nagpur

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COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN AE/ME/PK/EC/MC/CM/IT/AI/MT/TX/EE
COURSE CATEGORY:	HUMANITIES AND SOCIAL SCIENCE COURSE
COURSE CODE	: AE213G
COURSE TITLE	: INDUSTRIAL MANAGEMENT **
TEACHING SCHEME:	TH:03; TU:00;PR:00(CLOCK Hrs.)
TOTAL CREDITS	: 03 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEEEXAM	: 01 Hr.(Online Examination)
PR. TEEEXAM	: --
PT. EXAM	: 30 Minutes (MCQ)

❖ **RATIONALE:**

Diploma graduate works at middle management level in the industries / engineering organizations. Therefore he has to be proficient in planning, organizing & coordinating various activities of industries s/ organizations or when he is required to work in different types of projects.

They are also expected to deal with workforce and management problems. In the present era of competition, optimum utilization of the resources with achieving higher productivity is essential for any industry to survive. Quality and cost controls are also other important factors which contribute to the day to day supervision issues. This course aims to deal effectively with such issues along with familiarization of acts and laws applied to industries.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to

1. Use basic management principles to explore financial resources and management.
2. Use basic management principles to execute daily activities.
3. Use principles of planning and organizing for accomplishment of task .
4. Use principles of directing and controlling for implementing the plans.
5. Apply principles of safety management in all activities.
6. Apply various provisions of Industrial Acts.

❖ **COURSE DETAILS:****A. THEORY :**

Unit	Specific Learning Outcome(SLO) (Cognitive domain)	Topics and Sub-Topics	Hrs
1. Financial Management	1a. Describe given types of Ownership. 1b. Select suitable forms of ownership for given situations. 1c. Select suitable finance mode for a given venture. 1d. Compare share and debentures on given factors.	1.1 Forms of ownership Proprietorship, Partnership, Joint Stock. 1.2 Co-operative sector public sector, Govt. Undertaking Advantages Limitations & Application of each type comparison between different forms 1.3 Need of finance & sources of finance 1.4 Shares, debentures, types of shares, & comparison between shares & debentures, Break even analysis.	10
2. Introduction to Management Concepts and Managerial Skills	2a. Differentiate the concept and principles of management for the given situation. 2b. Describe functions of management for given situation. 2c. Compare the features of the given types of planning 2d. Suggest the steps in organizing in the given situation. 2e. Suggest suitable type of organization for the given example. 2f. Identify the functional areas of management for the given situation. 2g. Suggest suitable managerial skills for given situation with justification .	2.1 Definitions of management, role and importance of management. 2.2 Management characteristics and principles, levels of management and their functions; management, administration and organization, relation between management and administration. 2.3 Functions of management; planning, organizing, leading/directing, staffing and controlling. 2.4 Types of planning and steps in planning 2.5 Types of organization, Steps in organizing 2.6 Functional areas of management. 2.7 Managerial skill : Planning, decision making, problem solving and delegation	10
3. Planning & Organising	3a. Differentiate the nature of planning and planning activities for the given situation. 3b. Suggest the step wise procedure to complete the given activity in the shop floor. 3c. Select suitable forms for given activities. 3d. Prepare materials and	Planning at supervisory level 3.1 Planning by supervisor. 3.2 Planning activities, detailing and following of each step. 3.3 Prescribing standard forms for various activities. 3.4 Budgeting for materials and manpower Organizing at supervisory level 3.5 Organizing the physical resources.	08

	manpower budget for the given production activity. 3e. Describe with block diagrams the organization of the physical resources required for the given situation. 3f. Describe the human needs to satisfy the job needs for the given situation. 3g. Explain various tasks to be done by the concerned individuals for completing the given activity .	3.6 Matching human need with job needs 3.7 Allotment of tasks to individuals and establishing relationship among persons working in a group	
4. Directing and Controlling	4a. Justify the chosen need of directions and instructions to the subordinates to complete the given task. 4b. Select the feasible of instructions. to complete the given simple task, with justification 4c. Predict the possible mistakes for completing the given simple activity. 4d. Describe the managerial control actions and remedial measures required to be taken for completing the given task successfully with justification. 4e. Describe suitable control methods for given factor.	Directing at supervisory level 4.1 Needs for directions and instructions to subordinates; Completeness and feasibilities of instructions. 4.2 Personal counseling advanced predictions of possible mistakes. 4.3 Elaborating decisions, laying disciplinary standards in overall working. Controlling at supervisory level 4.4 Managerial control; understanding team and link between various departments in respect of process and quality standards; Steps in control process. 4.5 Controlling methods; Control over the performance in respect of quality, quantity of production, time and cost. Measuring performance, comparing with standards, correcting unfavorable deviations.	06
5. Safety Management	5a. Describe the general safety norms required to be taken in the given case. 5b. Suggest preventive measures of plant activities in the given situation. 5c. Describe the safe procedural steps required to be taken to prevent the given the type of accident. 5d. Prepare a work permit in to conduct the given maintenance activity.	5.1 Need for safety management measures 5.2 General safety norms for an industrial unit; Preventive measures. 5.3 Definition of accident, types of industrial accident, Causes of accidents 5.4 Fire hazards; Fire drill: Procedure and frequency 5.5 Safety procedure: Hazard occupational movement related to process, equipment	08

	5e. Describe the causes of the specified type of accident in the given situation. 5f. Prepare the specification of the firefighting equipment required for the given type of fire.	5.6 Work permits: Source countries migrants eligibility, age, maximum period of employment	
6. Legislative Acts	6a. Describe the purpose of the act . 6b. Describe the main provisions of the given acts and important definition.	6.1 Necessity of acts, Important definition and Main provisions of acts. 6.2 Industrial Acts : a. Indian Factory Act b. Industrial Dispute Act c. Workman Compensation Act d. Minimum Wages Act	06
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practical	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
NIL			

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Financial Management	02(00)	06(00)	04(02)	12(02)
2	Introduction to Management Concepts and Managerial Skills	02(00)	04(00)	04(02)	10(02)
3	Planning & Organising	02(00)	02(02)	06(00)	10(02)
4	Directing and Controlling	02(00)	04(02)	04(00)	10(02)
5	Safety Management	02(00)	04(00)	04(00)	10(00)
6	Legislative Acts	02(00)	02(02)	04(00)	08(02)
	Total	12(00)	22(06)	26(04)	60(10)

R–Remember U–Understand A–Analyze/Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Options
Q 01 To Q 35	1	R	2	1	U	2	1	U	2	1	U	2	1	A	2	30/35
	1	A	2	1	A	2	2	R	2	2	U	2	2	U	2	
	2	A	2	2	A	2	2	A	2	3	R	2	3	U	2	
	3	U	2	3	A	2	3	A	2	3	A	2	4	R	2	
	4	U	2	4	U	2	4	U	2	4	A	2	4	A	2	
	5	R	2	5	U	2	5	U	2	5	A	2	5	A	2	
	6	R	2	6	U	2	6	U	2	6	A	2	6	A	2	

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Cours e Outco mes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3, 4, 5, 6
		Class Room Assignments		Assignments	15	--	Assignment book	1, 2, 3, 4, 5, 6
	TEE (Term End Examination)	End Exam	Students	End of the Course	60	24	Theory Answer Scripts	1, 2, 3, 4, 5, 6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous assessment of practical	Students	End of every practical	--	--	Journal	1, 2, 3, 4, 5, 6
		Journal Writing		Assignment	--	--	Journal	1, 2, 3, 4, 5, 6
				Total	--	--		
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	Practical Answer Scripts	1, 2, 3, 4, 5, 6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4, 5, 6
	End of Course Survey			End of The Course	Questionnaires			

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	--	--	--	--	3	3	--	--
2	3	--	--	--	--	3	3	--	--
3	3	--	--	--	--	3	3	--	--
4	3	--	--	--	--	3	3	--	--
5	3	--	--	--	--	3	3	--	--
6	3	--	--	--	--	3	3	--	--

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

❖ **REFERENCE & TEXTBOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Industrial Engineering & Management	T.R.Banga & S.C.Sharma, Khanna Publishers, Edition-25, 2014	10:81-7409-078-9 13:978-81-7409-078-9
2	Industrial Engineering And Management	O.P.Khanna, Dhanpat Rai, New Delhi, 1980	81-885-9777-5
3	Industrial Organization and Management	Lawrence L Bethel & James L Riggs, New York, McGraw-Hill [1971], 6 th , 1979	09-322-3849-1
4	Industrial Management	I.K.Chopde & A.M.Sheikh, S.Chand & Co. Ltd, Delhi, 2 nd , 1999	81-219-1480-9
5	Industrial Engineering: Organization and Management	Tara Chand, Publisher: Nem Chand, 5 th , 1982	B0007BSSB0
6	Engineering Economics	Tara Chand, Publisher: Nem Chand, 14 th , 2014	81-85240-82-5
7	Entrepreneurial Development	S.S. Khanna, S. Chand & Co. Ltd, Delhi, 1 st , 1999, reprint 2006	81-219-1801-4

❖ **E-REFERENCES:**

- <http://www.free-management-ebooks.com/index.htm>, accessed on 18th Feb 2022
- https://www.youtube.com/watch?v=3VReVbsmjKI&ab_channel=NPTEL-NOCIITM accessed on 18th Feb 2022
- [https://www.youtube.com/watch?v=2Ie9uH9ySpo&ab_channel=Management study Guide](https://www.youtube.com/watch?v=2Ie9uH9ySpo&ab_channel=Management%20study%20Guide) accessed on 18th Feb 2022
- [youtube.com/watch?v=9QM-3LMeBQA](https://www.youtube.com/watch?v=9QM-3LMeBQA) accessed on 18th Feb 2022

❖ **LIST OF MAJOR EQUIPMENTS WITH SPECIFICATION:**

Nil

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute/Industry
1	Dr.G.K.Awari	Head of the Department, Automobile Engineering Deptt.	Government Polytechnic, Nagpur.
2	Dr.R.G.Choudhary	Head of the Department, Mechanical Engineering Deptt.	Government Polytechnic, Nagpur.
3	Dr.K.S.Dixit	Sr.Lecturer in Automobile Engineering Deptt.	Government Polytechnic, Nagpur.
4	Dr.S.A.Telang	Sr.Lecturer in Automobile Engineering Deptt.	Government Polytechnic, Nagpur.

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GOVERNMENT POLYTECHNIC, NAGPUR.
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COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN COMPUTER ENGINEERING
COURSE CATEGORY	: PROGRAMME CORE COURSE
COURSE CODE	: CM301G ^{\$}
COURSE TITLE	: OPERATING SYSTEM
TEACHING SCHEME	: TH:03; TU: 00;PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 04 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs
PT. EXAM	: 01 HR

❖ **RATIONALE:**

Operating system is the interface between the user and the computer system. It is the first piece of software to run on a computer system when it is booted. It's job is to co-ordinate and provide services for the execution of application software. This course describes the fundamental concepts behind operating systems. It familiarizes the students with the concepts and functions of operating system. It provides knowledge to develop systems using advanced operating system concepts of operating system.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to—

1. Install operating system and configure it.
2. Use various OS components, services & structure.
3. Execute process commands for performing process management operations.
4. Apply scheduling algorithm for process management.
5. Evaluate efficiency of different memory management techniques.
6. Implement the file management techniques.

❖ **COURSE DETAILS:****A. THEORY :-**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. Overview of Operating System	1a. Describe the functioning of given component of OS. 1b. Identify type of operating system suitable for the given type of application. 1c. Classify the given operating system for Command line or GUI OS based on the different characteristics.	1.1 Operating system – Concept, Components of computer system, Operations of OS: Program management, Resource management, Security and protection; Views of OS: User view, SystemView 1.2 Different Types of Operating System- Batch operating system, multi programmed, Time Shared OS, Multiprocessor Systems, Distributed Systems, Real time systems. Mobile OS (Android, iOS). 1.3 Command line based OS-DOS, UNIX; GUI base OS-WINDOWS, LINUX	04
2. Services and Components of the Operating System	2a. Describe the given services of operating system. 2b. Illustrate use of the given System call of specified OS. 2c. Identify the need and functions of OS components. 2d. Use of OS for the given components.	2.1 Different Services of Operating System.: - User Interface, program execution, I/O operations, File-system manipulation, Communications, Error detection, Resource allocation, Accounting, Protection and security. 2.2 System Calls- Concept, types of system calls. 2.3 OS Components: - Process Management, Main Memory Management, File Management, I/O System management, SecondaryStorage management. 2.4 Use of operating system to user management, security policy, device management, performance monitor, task scheduler	10

3. Process Management	3a. Describe the given states of OS. 3b. Demonstrate the work of given scheduling queues. 3c. Identify the need of inter process communication. 3d. Apply characteristics of executing the given multithreading model.	3.1 Process-: process states, Process Control Block (PCB). 3.2 Process Scheduling- Scheduling Queues, Schedulers, Context Switch. 3.3 Inter-process communication(IPC): Introduction, shared memory system and message passing system. 3.4 Threads - Benefits, users and kernel threads, Multithreading Models	08
4. CPU Scheduling and Algorithms	4a. Describe with example the procedure of allocating CPU to the given process using the specified OS. 4b. Calculate turnaround time and average waiting time of the given scheduling algorithm. 4c. Illustrate functioning of the given necessary condition leading to deadlock.	4.1 Scheduling types - scheduling Objectives, CPU and I/O burst cycles, Pre-emptive, Non Pre-emptive Scheduling, Scheduling criteria. 4.2 Types of Scheduling algorithms – First come first served (FCFS), Shortest Job First (SJF), Shortest Remaining Time(SRTN), Round Robin (RR) Priority scheduling, multilevel queue scheduling. 4.3 Deadlock - System Models, Necessary Conditions leading to Deadlocks, Deadlock Handling - Preventions, avoidance.	10
5. Memory Management	5a. Describe the working of given memory Management Techniques. 5b. Illustrate characteristic of the given memory management techniques. 5c. Calculate Page fault for the given page reference string.	5.1 Basic Memory Management - Partitioning, Fixed and Variable, Swapping, fragmentation. 5.2 Virtual Memory - Introduction to Paging, Segmentation and Page fault. 5.3 Page Replacement Algorithms: FIFO, LRU, Optimal.	10
6. File Management	6a. Describe structure of the given file system with example. 6b. Describe mechanism of the given file access method. 6c. Illustrate features of the given Raid level structure of hard disk.	6.1 File Concepts, Attributes, Operations, types and File System Structure. 6.2 Access Methods - Sequential, Direct File-Allocation Methods- Contiguous, Linked, Indexed. Free Space management Techniques- Bitmap and Linked List. 6.3 Directory structure-- Single level, two levels, tree structured directory, Disk Organization and disk Structure- Physical structure, Logical structure, Raid structure of disk, raid level 0 to 6.	06
Total Hrs			48

B. LIST OF PRACTICALS / LABORATORY EXPERIENCES / ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs
1	Install and configure Linux (or alike) operating system.	1. Overview of Operating System	02
2	Execute general purpose commands date, time, cal, clear, banner, tty, script, man.		02
3	Work with multiple linux terminals and basic commands: who, who am, su, pwd	2. Services and components of the Operating System	02
4	Use Operating services (Editor, GUI, File handling.) Run commands to start, stop, and restart the specified service in Linux.		02
5	Execute process commands- ps, wait, sleep, exit, kill.	3. Process Management	02
6	Develop a C program to calculate total waiting and turnaround time of n processes with First Come First Serve CPU scheduling algorithm.	4. CPU Scheduling and Algorithms	02
7	Develop a C Program for Shortest Job first Scheduling Algorithm.		02
8	Write a 'C' program to implement FIFO page replacement algorithm.	5.Memory Management	02
9	Execute file and directory manipulation commands — ls, rm, mv, cp, join, split, cat (file saving and redirection operator), head, tail, touch,	6.File Management	02
10	Execute file and directory manipulation commands — diff, comm., pr, chmod, mkdir, rmdir, cd, pwd, dir, cmp. (Use wild card character).		02
11	Execute text processing tr,wc, cut, paste, spell, sort, grep, more		02
12	Develop Shell Script by using following Control statements features- "if"statement		04
13	Develop Shell Script by using following Control statements features- "for" statement, exit, break, continue.		04
14	Develop Shell script to find out whether -File has read, write, and execute permissions?		02
Total Hrs			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Overview of Operating System	02(02)	00(00)	00(00)	02(02)
2	Services and components of the Operating System	02(02)	03(03)	06(00)	11(05)
3	Process Management	02(00)	03(03)	06(03)	11(06)
4	CPU Scheduling and Algorithms	02(02)	06(00)	06(06)	14(08)
5	Memory Management	02(00)	03(03)	06(06)	11(09)
6	File Management	02(00)	03(03)	06(03)	11(06)
	Total	12(06)	18(12)	30(18)	60(36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

T-Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
1	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	2	R	2	4	R	2										
2	2	U	3	2	A	3	2	A	3	2	U	3	3	A	3				3/5
3	3	U	3	4	U	3	4	U	3	4	A	3	4	A	3				3/5
4	5	U	3	3	A	3	3	A	3	3	U	3	5	U	3				3/5
5	6	U	3	6	A	3	6	A	3	6	U	3	6	A	3				3/5
6	4	A	6	5	A	6	5	A	6										2/3

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	15	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	60	24	Theory Answer Scripts	1,2,3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End of the Course	50	20	Practical Answer Scripts	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Installation/configuration of operating system	10
2	Correctness of Executing various commands	10
3	Writing and executing programs to get desired output	10
4	Debugging the program	10
5	Submit journal report in time	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	-	-	3	-	-	3	-	-
2	3	-	-	3	-	-	-	-	-
3	3	-	3	3	-	-	-	-	-
4	3	-	3	3	-	-	3	3	-
5	3	-	3	3	-	3	3	3	-
6	3	-	3	3	-	3	3	3	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Operating System Concepts	Silberschatz, Galvin	John Wiley and Sons, Ninth Edition, 2015, ISBN: 978-51-265-5427-0
2	Operating System	Godbole, Achyut S.	Tata McGraw Hill Education, 2015, ISBN: 9780070591134
3	Operating Systems: Internals and Design Principles	Stallings, William	Pearsons, 8 edition 2015 ISBN: 978-0133805918
4	Operating System	Dhamdhare, Dhanjay M.	McGraw Hill, 2015 ISBN MO 978-1-25-900558-9

❖ **E-REFERENCES:**

- https://onlinecourses.nptel.ac.in/noc20_cs04/preview , accessed on 12th December 2021
- <https://www.cse.iitb.ac.in/~mythili/os/>, accessed on 12th December 2021
- <https://whatis.techtarget.com/definition/operating-system-OS> , accessed on 12th December 2021
- www.tutorialspoint.com/operating_system/index.htm , accessed on 12th December 2021
- <https://www.javatpoint.com/os-tutorial> , accessed on 12th December 2021

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

1. Computer system
(Any computer system with basic configuration)
2. Linux or alike operating system such as Ubuntu, CentOS or any other.

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr.M.V.Sarode	HOD.,Computer Engineering	G.P.Nagpur
2	Mrs.D.S.Nalinde	Lecturer in CM	Course Expert G.P.Nagpur
3	Mrs.C.R.Chaudhari	Lecturer in CM	Course Reviewer G.P.Nagpur
4	Mr.S.A.Khatri	Lecturer in CM	Course Reviewer G.P.Nagpur
5	Mr.Dipak Dhote	Operations Manager,	IT-Network Infosystems Pvt LTD,Nagpur
6	Dr.Rakesh Kadu	Assistant Professor, I.T.	Ramdeobaba College of Engg. and Management, Nagpur
7	Mrs.V.A.Raje	System Analyst	MSBTE,RO Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN COMPUTER ENGINEERING
COURSE CATEGORY	: PROGRAM CORE COURSE
COURSE CODE	: CM302G^{\$}
COURSE TITLE	: ADVANCE JAVA
TEACHING SCHEME	: TH:03; TU: 00;PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 04 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR Credit. = 2 CLOCK HR.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs
PT. EXAM	: 01 HR

❖ **RATIONALE:**

Java technology is widely used for development of network and web applications. Java is a commonly used language for web development, especially on the server-side. Java web applications are distributed applications that run on the internet. Web development with Java allows us to create dynamic web pages where users can interact with the interface. This course will equip students with required knowledge and skill of object oriented programming approach needed for the development of robust, powerful web applications.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to—

1. Develop java program for client server communication.
2. Develop program to establish the connection with database.
3. Design event driven GUI for java applications using AWT .
4. Develop GUI applications using swing framework.
5. Design web application using servlets.
6. Design web application using JSP.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs .
1. Networking and Socket Programming	1a. Identify the class of given IP address. 1b. Describe the use of given class/interface in java.net package. 1c. Use Inet Address class methods to get the details of given host. 1d. Develop java program to establish Client/Server connection using TCP/IP to transfer given information. 1e. Use URL Connection classes to read and write data to the specified resource referred by the given URL. 1f. Write java program to illustrate the connectionless Client/Server communication for sending/receiving given information.	1.1 TCP/IP Addressing, TCP/IP internals 1.2 Network Programming Basics, Networking Classes and Interfaces 1.3 Inet Address – Factory Methods, Instance Methods 1.4 TCP/IP – Client Sockets, TCP/IP Server Sockets 1.5 URL, URL Connection, Http URL Connection, The URI Class, Cookies 1.6 Datagrams – Datagram Socket, Datagram Packet	06
2. Java Database Connectivity	2a. Describe given component of JDBC. 2b. Describe given JDBC architecture for data access. 2c. Use the relevant type of JDBC driver for specified environment. 2d. Write JDBC program to communicate with specified database using java.sql package classes and interfaces. 2e. Describe the steps with example to establish connection with specified database.	2.1 JDBC Introduction: JDBC Product components- The JDBC API, JDBC Driver Manager, JDBC Test Suite, JDBC-ODBC Bridge 2.2 JDBC Architecture – Two Tier and Three Tier Model 2.3 Types of JDBC Drivers 2.4 The java.sql package classes and interfaces: Driver, Driver Manager, Connection, Statement, Prepared Statement, Result Set 2.5 Steps to write JDBC program	08

3. Abstract Windowing Toolkit, Event Handling	3a. Describe given phase of applet life cycle using a typical example. 3b. Create Frame window with specified AWT components. 3c. Arrange the GUI components using specified layout manager. 3d. Use delegation event model to develop event driven program for the given problem statement.	3.1 Applet: Applet Fundamentals, Applet Life Cycle 3.2 GUI Programming with Java: The AWT class hierarchy, Component, Container, Window, Frame, Panel, 3.3 Components – Button, Text Field, Text Area, Label, Scroll Bar, Check Box, Choice, List, Layout Management - Layout Manager types – Border, Grid and Flow, GUI programs with AWT 3.4 Event Handling: Events, Event sources, Event classes, Event Listeners, Relationship between Event sources and Listeners, Delegation event model, Examples: handling a button click, handling mouse events, Adapter classes.	08
4. GUI Programming with Swing	4a. Differentiate AWT and Swing on given aspect. 4b. Develop GUI programs using given Swing components. 4c. Use given type of button in Java based GUI. 4d. Develop GUI programs using advanced swing components. 4e. Develop event-driven GUI programs using swing components and event handling mechanism.	4.1 Introduction to Swing: Swing features, Difference between AWT and Swing 4.2 Swing Components: JApplet, Icons and Labels, Text Fields, Combo Boxes 4.3 Buttons: JButton, Check Boxes, Radio Buttons 4.4 Advanced Swing Components: Tabbed Panes, Scroll Panes, Trees, Tables, Progress Bar, Tool Tips 4.5 MVC Architecture	06
5. Servlet	5a. Describe function of given method of servlet life cycle. 5b. Use relevant Generic servlet to develop given web based application. 5c. Use relevant Http servlet to develop specified web based application. 5d. Develop java servlet Using Cookies and Session Tracking for given problem	5.1 The life cycle of a servlet 5.2 Creating simple servlet: The servlet API, javax.servlet package, Servlet Interface, ServletConfig Interface, ServletContext Interface, ServletRequest Interface, ServletResponse Interface, GenericServlet Class 5.3 The javax.servlet.http package:	10

	statement.	HttpServletRequest Interface, HttpServletResponse Interface, HttpSession Interface, Cookie Class, HttpServlet Class Handling Http Requests and Responses, Handling Http GET Requests, Handling Http POST Requests 5.4 Cookies and Session Tracking	
6. Java Server Pages	6a. Justify use of JSP over servlet for given parameters. 6b. Use JSP scripting element and JSP directives for given problem statement. 6c. Use JSP action tag for implementing given problem statement. 6d. Implement JSP program using JSP implicit object 6e. Develop JSP program using Cookies and JSP Session Tracking for given problem statement.	6.1 JSP Overview: The Problem with Servlets, Life Cycle of JSP 6.2 JSP Scripting elements – scriptlet tag, expression tag, declaration tag, JSP Directives- page, include, taglib, 6.3 JSP Action tags – jsp:forward, jsp:include, jsp:setProperty, jsp:getProperty jsp:param 6.4 JSP Implicit Objects- out, request, response, config, application, session, pageContext, page, exception 6.5 JSP Form Processing, JSP Session and Cookies Handling, JSP Session Tracking	10
		Total Hrs.	48

B. LIST OF PRACTICALS / LABORATORY EXPERIENCES / ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Develop java program to demonstrate factory and instance methods of InetAddress	1. Networking and Socket Programming	02
2	Develop java program to establish connection with specified website using HttpURLConnection and display its request method, response code and response message		
3	Develop java program to establish client server communication using – i) Connection Oriented protocol (TCP/IP) ii) Connectionless protocol (UDP)		02
4	Develop java program to establish database connection with specified database	2. Java Database Connectivity	02

5	Develop java program to fetch data from specified database and display		02
6	Develop java program to execute queries on specified database using Prepared Statement		02
7	Develop java program to demonstrate use of AWT components like Label, TextField, Text Area, Button, Check Box, Radio Button etc.	3. Abstract Windowing Toolkit, Event Handling	02
8	Develop a program using AWT where menu bar contains items such as File, Edit, View and create a submenu under a File menu: New and Open		02
9	Develop java program to demonstrate various mouse events using Mouse Listener Mouse Motion Listener interface		02
10	Develop java program to demonstrate use of Swing components like JLabel, JTextField, JButton, JCheckBox, JRadio Button etc.	4. GUI Programming with Swing	02
11	Develop program using Swing to display a Scroll Pane and JComboBox in JApplet with the items – English, Marathi, Hindi Sanskrit		02
12	Develop java program based on Generic Servlet	5. Servlet	02
13	Develop java program based on HttpServlet, Cookies, Session Tracking		04
14	Develop java program based on Java Server Pages, Session Tracking, Cookies	6. Java Server Pages	06
Total Hrs			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Networking and Socket Programming	02(02)	03(00)	06 (03)	11(05)
2	Java Database Connectivity	02(00)	03(00)	06(06)	11(06)
3	Abstract Windowing Toolkit, Event Handling	02(00)	03(03)	03(03)	08(06)
4	GUI Programming with Swing	02(00)	03(03)	03(03)	08(06)
5	Servlet	02(02)	03(03)	06(03)	11(08)
6	Java Server Pages	02(02)	03(03)	06(00)	11(05)
	Total	12(06)	18(12)	30(18)	60(36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER

T- Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1R2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Options
1	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	5	R	2	6	R	2										
2	1	U	3	1	A	3	1	A	3	1	A	3	3	U	3				3/5
3	2	U	3	2	A	3	2	A	3	3	A	3	4	U	3				3/5
4	3	U	3	3	A	3	4	U	3	4	A	3	5	U	3				3/5
5	5	U	3	6	U	3	4	A	3	5	A	3	6	U	3				3/5
6	5	A	6	6	A	6	2	A	6										2/3

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assign-ments	15	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	60	24	Theory Answer Scripts	1,2,3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assign-ments	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End of the Course	50	20	Practical Answer Scripts	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form		1, 2, 3, 4,5,6	
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Writing Logic of Program .	10
2	Program Execution	20
3	Error Debugging	10
4	Viva Voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	-	3	3	-	-	-	3	-
2	3	-	3	3	-	-	-	3	3
3	3	-	3	3	-	-	-	3	-
4	3	-	3	3	-	3	3	3	3
5	3	-	3	3	2	3	3	3	3
6	3	-	3	3	2	3	3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Java: The Complete Reference	Herbert Schildt, McGraw Hill, Eleventh edition, 2020	978-9390491629
2	Introduction to Java Programming	Y. Daniel Liang, PHI, 10th edition, 2013	978-0133761313
3	Head First Java	Kathy Sierra, Bert, Trisha Gee O'Reilly Media; 3rd edition, 2022	978-1491910771

❖ **E-REFERENCES:**

- <https://docs.oracle.com/javase/tutorial/> accessed on 4th August 2022
- <https://introcs.cs.princeton.edu/java/home/> accessed on 4th August 2022
- <https://docs.oracle.com/en/java/index.html> accessed on 4th August 2022
- <https://math.hws.edu/javanotes/> accessed on 4th August 2022

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION :-**

1. Processor requirements: minimum a Pentium 2 266 MHz processor.
2. Memory Requirements: On Windows 64-bit operating systems, in 32- or 64-bit mode, the Java runtime requires a minimum of 128MB of memory

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr.M.V.Sarode	Head of Department (Computer Engg.Dept.)	Government Polytechnic Nagpur
2	Mr.S.A.Khatri	Lecturer in Computer Engineering	Government Polytechnic Nagpur
3	Mr.M A.Rahman	Lecturer in Computer Engineering	Government Polytechnic Nagpur
4	Mr.A.A.Uike	Lecturer in Computer Engineering	Government Polytechnic Nagpur
5	Mr.Dipak Dhote	Operations Manager,	IT-Network Infosystems Pvt LTD, Nagpur
6	Dr.Rakesh Kadu	Assistant Professor, I.T.	Ramdeobaba College of Engg, and Management, Nagpur.
7	Mrs.V.A. Raje	System Analyst	MSBTE,RO Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN INFORMATION TECHNOLOGY / COMPUTER ENGINEERING /AIML
COURSE CATEGORY	: PROGRAM ELECTIVE COURSE
COURSE CODE	: IT305G
COURSE TITLE	: SOFTWARE TESTING
TEACHING SCHEME	: TH: 03; TU: 00; PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 04 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs
PT. EXAM	: 01 HR

❖ **RATIONALE:**

This course presents the concepts and techniques for testing software and assuring its quality. Course describes how to apply the Testing concepts to any software testing situation and how testing is more efficient and effective by using a classical engineering approach. This course is also helpful to Inculcate essential software testing skill about automated testing capabilities for functional, regression, GUI, and data-driven testing, required to reasonably test a system under development.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Identify the importance of testing techniques in software quality management & assurance.
2. Apply different types of Testing Techniques.
3. Design Test Cases for different levels of Testing.
4. Test different software applications for various software risks.
5. Build Defect Report of any web application under Test.
6. Use at least one test automation tool to demonstrate the test automation.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs
1. Basics of Software Testing	1a. Evaluate the Quality of test software on the basis of Software Quality attributes. 1b. State why Software Testing is Important. 1c. Identify Errors and Bugs in software applications. 1d. Evaluate Entry and Exit Criteria for given test application. 1e. Describe Software Testing Life Cycle (STLC) 1f. Validate the given test software using V & V Model in relation to quality assurance.	1.1 Software quality ,Software Quality Assurance and Quality Control , Software Quality Attributes , Precision and Accuracy 1.2 Define Testing, Its Objective and need, Infamous Software Error Case Studies, Role of testing ,Testing Principles, Attributes of Good Tester 1.3 Terminology: Bugs,Error,Defect,Fault, Failure, Testing Axiom-The Pesticide Paradox, Debugging v/s Testing. 1.4 When to start and stop Testing 1.5 The Software Development Process, Product Components, Software Project Staff, Cost of testing, Verification and validation	08
2. Types of Testing	2a. Differentiate different types of testing methods on the basis given points. 2b. Apply high-level Techniques used for reviewing a given product specification. 2c. Apply Various White box testing Techniques to test given specified web application. 2d. Apply Various Black box testing Techniques to test given specified web application. 2e. Make use of Review Code Technique to find errors in test software.	2.1 Black-Box and white-box Testing, Static and Dynamic Testing, Static Black Box Testing: Testing The Specification , Static White Box Testing: Examining Design and Code 2.2 Performing a High Level Review of the Specification, Low Level Specification Test Techniques 2.3 White Box Test Techniques: Static Testing –Review, Walkthrough, Inspection, Structural Testing –Code Functional, Code Coverage, Code Complexity –Cyclomatic Complexity 2.4 Black Box Test Techniques: Requirement Testing, Positive & Negative Testing, Boundary Value Analysis, Equivalence Partitioning, Decision Tables, User Documentation Testing, Graph Based Testing. AND Other Black Box Test Techniques 2.5 Test-to-pass and Test-to-fail , Generic Code Review Checklist-Data Reference Errors, Data Declaration	10

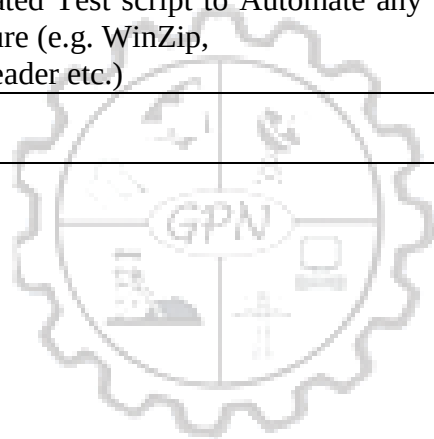
		Errors, Computation Errors, Comparison Errors, Control Flow Errors, Subroutine Error, I/O Errors	
3. Levels of Testing & Writing Test Cases	3a. Apply Testing Levels for given web based application 3b. Test the software for given special Tests. 3c. Create Test Cases for given Test Scenario's. 3d. Prepare test scenarios and Test Data for specified web applications. 3e. Prepare Test Report of executed test cases for given applications.	3.1 Levels of Testing: Unit Testing-Drivers, Stubs Integration Testing-Top down and Bottom Up Testing, Bi-Directional Integration Testing. Testing on web application-Performance Testing, Load Testing, Stress Testing, Security Testing Acceptance Testing –Alpha Testing, Beta Testing 3.2 Regression Testing ,Smoke and Sanity Testing ,Usability, Compatibility Testing 3.3 Test Case, Test Case Specification, Best Practice for writing good Test Cases, Difference between Test Case and Test Scenario 3.4 Preparing test scenarios and Test Data, Writing test cases -User Interface, Functional & Security Test Cases.	08
4. Applying Testing Skills	4a. Prepare Test Plan for software under test. 4b. State why Configuration & Compatibility Testing is necessary. 4c. Identify fundamental parts of a given web page that need to be tested. 4d. Apply basic white-box and black-box techniques to test given web application. 4e. Generate the Test Cases for User interface testing of software under test.	4.1 Test Planning, Test Planning V/s Test Execution, Scope Management, Test Approach, Setting Up criteria for testing, Identify Responsibility, Staffing & Training, Resource Requirements ,Test Deliverables, Testing Tasks. 4.2 An Overview of Configuration Testing, Approaching the Task. 4.3 Compatibility Testing Overview, Platform and Application Versions, Standards and Guidelines, Data Sharing Compatibility. 4.4 User Interface Testing, Making a Good UI, Testing for the Disabled. 4.5 Web Testing Checklists-Functionality Testing, Usability testing, Interface testing, Compatibility testing, Gray-Box Testing,Performance testing, Security testing	10
5. Defect Managemen	5a. Evaluate Cost and economy Aspects related to Testing.	5.1 Cost of Testing, , Testing and Risk 5.2 Test Strategies, Preventive versus Reactive Approach, Analytical	06

t	5b. Apply Test Strategies to test software. 5c. Classify Defects on the basis of estimated Impact 5d. Build Defect Report on any given application. 5e. Apply defect Management process on suitable software.	versus. Heuristic Approach Testing Metrics 5.3 Defect Classification, Defect Management & Prevention ,Defect Life Cycle, 5.4 Defect Report Template ,Defect Logging and Tracking	
6. Automated Testing & Testing Tools	6a. Describe the necessity of test tools and Test automation. 6b. Identify Different Automation Testing Tools to test given application. 6c. Build Automated Test Scripts for sample application. 6d. Develop Methodology to select automation Tool to improve efficiency of testing. 6e. Evaluate Software Testing Metrics in Testing given web application.	6.1 Manual Testing, Limitations of Manual Testing ,Automated Testing & its Benefits, Test Tools, Random Testing, Realities of Using Test Tools and Automation ,when not to automate 6.2 Selection of Best Tool, Types of Test Tools ,advantage and disadvantage of using Test Tools, Test Automation, Testing Using Automated Tools. 6.3 Test Script, Difference Between Test Case And Test Script, ways to create a test script, Run the Test Script 6.4 Define Metrics, Measurements ,Types of Metrics-Process Metrics, Product Metrics, Object Oriented Metrics	06
		Total Hrs.	48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Develop program in C/C++ to find the roots of a quadratic equation and perform Boundary Value Analysis (BVA)	2.Types of Testing	04
2	Develop a program in C/C++ to find the area of a circle, triangle, square and rectangle and perform Equivalence Class testing.		02
3	Develop a C program to Find the Largest Number Among Three Numbers and Test the same using basis path testing also find it's Cyclomatic Complexity by all the three methods.		02

4	Design Test Cases for Purchase Order Management Specification.	3. Levels of Testing & Writing Test Cases	04
5	Test a website using automation tool like QTP, Winrunner , Selenium etc) and Prepare Test Report of executed Test Cases.	4. Applying Testing Skills	04
6	Test to Perform load and performance testing of web application with Load Testing Tool -JMeter (Apache JMeter).		04
7	Demonstrate test management tool (e.g. Test Director) for testing given web application.		02
8	Use Bug Tracking Tool (e.g. Bugzilla, Bugit, etc) for test software	5.Defect Management	04
9	Use any automated test tool.(e.g. Autoit V3 tool) to test 1) If...else 2) For ...Loop 3)Do...Until 4) Switch .Case	6. Automated Testing &Testing Tools	02
10	Develop any GUI Application e.g. Calculator and Automate using Autoit V3 tool.		02
11	Develop an automated Test script to Automate any installation procedure (e.g. WinZip, Winrar, Acrobet Reader etc.)		02
Total Hrs			32



❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Basics of Software Testing	02(02)	03(03)	03(00)	08(05)
2	Types of Testing	02(02)	03(03)	03(00)	08(05)
3	Levels of Testing & Writing Test Cases	02(02)	03(00)	06(06)	11(08)
4	Applying Your Testing Skills	02(00)	03(03)	06(03)	11(06)
5	Defect Management	02(00)	03(03)	06(03)	11(06)
6	Automated Testing & Testing Tools	02(00)	03(00)	06(06)	11(06)
	Total	12(06)	18(12)	30(18)	60(36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

T-Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Options
1	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	2	R	2	3	R	2										
2	1	U	3	2	U	3	3	U	3	4	U	3	5	U	3				3/5
3	4	U	3	5	U	3	6	U	3	1	U	3	2	U	3				3/5
4	1	A	3	2	A	3	3	A	3	3	A	3	4	A	3				3/5
5	3	A	3	4	A	3	4	A	3	3	A	3	5	A	3				3/5
6	5	A	6	6	A	6	6	A	6										2/3

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	15	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	60	24	Theory Answer Scripts	1,2,3,4,5, 6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End of the Course	50	20	Practical Answer Scripts	1,2,3,4,5, 6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course Survey			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Identification of specification	10
2	Generating Test Scenario, Test Cases, Use of automated test tool, Tool Demonstration.	20
3	Automate procedure-Test Scripts, selection of proper testing method & Tool	10
4	Viva Voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:IT**

Course Outcome s (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	--	--	--	--	--	--	--	3
2	3	--	--	--	--	--	--	--	3
3	3	3	3	--	--	--	--	--	3
4	3	3	3	--	--	--	--	--	3
5	3	3	3	2	--	--	--	--	3
6	3	3	3	2	--	--	--	--	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:CM**

Course Outcome s (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	--	--	--	--	--	--	3	--
2	3	--	--	--	--	--	--	3	--
3	3	3	3	--	--	--	--	3	--
4	3	3	3	--	--	--	--	3	--
5	3	3	3	2	--	--	--	3	--
6	3	3	3	2	--	--	--	3	--

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N .	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Software Testing	Pearson Education India ,Second Edition	9788177580310
2	Software Testing Foundations	Andreas Spillner, Tilo Linz, Hans Schaefer, Spillner, Linz, Schaefer, 4th Edition, 2014	978-1937538422
3	Foundations Of Software Testing	AdityaMathur,2nd Edition ©2014 Addison-Wesley Professional	13:9780134195728
4	The Art Of Software Testing	Glenford J. Myers Tom Badgett Corey Sandler, Johnwiley& Sons, Inc., Hoboken, New Jersey., Third Edition	978-1-118-03196-4 978-1-118-13313-2

❖ **E-REFERENCES:**

- Software Engineering – A Practitioner’s Approach, 7th Edition, Roger Pressman
- Bugzilla-<https://www.bugzilla.org/>Accessed on 20/01/2022
- Selenium -<https://www.selenium.dev/>Accessed on 20/01/2022
- AutoIt -<https://www.autoitscript.com/site/>Accessed on 20/01/2022

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

1. Computer System with Latest Configuration
2. Selenium 4 /QTP4.53
3. Autoit Toolv3.2.12.1
4. Bugzilla
5. Spreadsheet Package

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr.A.R.Mahajan	HoD, Information Technology	Govt.Polytechnic, Nagpur.
2	Dr.M.V.Sarode	HoD, Computer Engineering	Govt. Polytechnic, Nagpur.
3	Mr.Dipak Dhote	Operations Manager, IT-Network Infosystems Pvt LTD	Industry Expert
4	Dr.Rakesh Kadu	Assistant Professor, I.T., Ramdeobaba College of Engg. and Management, Nagpur.	Member from Academics (External)
5	Mrs.V.A.Raje	Lecturer in C.O., G.P.Arvi	MSBTE Nominee
6	Mr.M.N.Gawande	Lecturer in Electrical Engg.	CDC In Charge
7	Mrs.D.P.Chanmanwar	Lecturer in IT	Member (Internal)

8	Mr.L.D.Vilhekar	Lecturer in IT	Member (Internal), Course Reviewer
9	Mr.M.A.Rahman	Lecturer in CM	Course Expert CM
10	Mr.S.J.Pukale	Lecturer in IT	Course Expert IT

(Member Secretary PBOS)

(Chairman PBOS)



GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN COMPUTER ENGINEERING
COURSE CATEGORY	: PROGRAMME ELECTIVE COURSE
COURSE CODE	: CM304G^{\$}
COURSE TITLE	: INTERNET OF THINGS
TEACHING SCHEME	: TH: 03; TU: 00; PR: 02(CLOCK Hrs.)
TOTAL CREDITS	: 04 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs
PT. EXAM	: 01 HR

❖ **RATIONALE:**

IoT (Internet of Thing) is playing vital role in industrial sector and domestic applications. This course gives a basic understanding about concept, facts, principles and working of various elements of IoT systems used in industries as well as domestic applications. The students can use this knowledge to develop competency to work in various Industrial sectors and various domestic applications.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Use general concepts of Internet of Things (IoT).
2. Interface various devices, sensors with microcontroller.
3. Analyze various M2M and IoT architectures.
4. Use IoT communication models and protocols
5. Develop IoT application using Aurdino/Raspberry PI.
6. Adapt IoT framework, Its importance and applicability to society

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. Introduction to Internet of Things	1a. Explain Internet of Things & fundamental components of IoT. 1b. Discuss various properties and advantages, disadvantages of IoT. 1c. Compare physical & logical design of IoT. 1d. Elaborate different models & APIs of IoT . 1e. List various applications of IoT.	1.1 Definition of Internet of Things (IoT), history of IoT, Fundamental Component of IoT. 1.2 Characteristics of IoT, Advantages & Disadvantages of IoT 1.3 Physical design of IoT, Logical Design of IoT 1.4 IoT Communication Model, IoT Communication APIs. 1.5 Application of IoT	06
2. Sensors, Actuators & Microcontrol lers	2a. Select the sensor for application in the given situation with justification. 2b. Select the actuator for application in the given situation with justification. 2c. Decide the suitable microcontroller in given situation with its significance.	2.1 Sensor – Light Sensor, moisture Sensor, Temperature sensor, proximity sensor, pressure sensor, Gyroscope, Infrared Sensor, Optical sensor 2.2 Actuators- Digital micromirror device, Electric motor, Electroactive polymer, Piezoelectric actuator, Pneumatic actuator, Servomechanism, Stepper motor. 2.3 Microcontroller in IoT, Microcontroller Vs Microprocessor, Microcontroller Features, RTOS/OS for Microcontrollers, How to Choose a Microcontroller for IoT, List of Microcontrollers for IoT.	08
3. IoT and M2M	3a. Describe with diagram all system layers & design standard of IoT/M2M. 3b. Illustrates how the different components plays vital role in value chain. 3c. Compare the given terms on the basis of given parameters.	3.1 IoT/ M2M system layers & Design standardization, Difference between IoT and M2M 3.2 M2M Value Chains, IoT Value Chains 3.3 SDN and NFV for IoT:- Software defined networking, network function virtualization	08
4. IoT Communicati on model and protocols	4a. Choose the appropriate application protocol for given system . 4b. Select communication API based on given situation.	4.1 IoT Communication model and protocols. Application protocols: • HTTP(Introduction, features) • CoAP(Introduction, CoAP position, CoAP message type, CoAP Request-Response model)	09

	4c. Compare network layer protocols on the basis on given points.	• MQTT(Introduction, Component, Method, Application) • AMQP(Introduction, features, Frame type, Component) 4.2 Communication API:- REST based, Web Socket based 4.3 Network layer protocols: • IPv4 • IPv6 • LoWPAN(Introduction, Features, Addressing, Packet format)	
5. Hardware Element of IoT Arduino & Raspberry Pi	5a. Design the Arduino based IoT application with relevant sketch. 5b. Design the Raspberry Pi based IoT application with relevant sketch.	5.1 Arduino : Hardware element of IoT • Basic Block diagram of Arduino application • Arduino pin details, Pin configuration, I/O function, Memory usage • Micro controller peripheral usage(PWM & interrupts) • Communication protocol : UART,SPI,I2C • Interfacing diagram of IoT sensors and actuators • Debug application using Arduino IDE 5.2 Raspberry Pi : Hardware element of IoT • Overview of Raspberry Pi hardware platform • Various models of Raspberry Pi • Pinout, GPIO, Features & specification	08
6. IoT Case Studies	6a. Develop a report based on the given case study.	6.1 IoT Case Studies • Home automation • Industry application • Surveillance application • Agriculture • Healthcare • Transportation	09
Total Hrs.			48

B. LIST OF PRACTICALS / LABORATORY EXPERIENCES / ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Introduction to various sensors and various actuators & its Application (Students have to prepare Report for the same).	2. Sensors, Actuators & Microcontrollers	2
2	Perform Experiment using Arduino Uno to measure the distance of any object using Ultrasonic Sensor.		2

3	Perform Experiment using Arduino Uno to use humidity & temperature sensor.		2
4	Perform Experiment using Arduino Uno to use PIR motion sensor.		2
5	Perform Experiment using Arduino Uno to control stepper motor sensor.		2
6	HC-05 Bluetooth Module with Arduino-MIT App Inventor.	4. IoT Communication model and protocols	4
7	Creating Arduino Web server and controlling things via WiFi (ESP8266).		6
8	Demonstration of Setup & Working of Raspberry Pi. (Students have to prepare the report for the same.).	5. Hardware element of IoT Arduino & Raspberry Pi	2
9	Perform experiment to interface IR sensor with raspberry pi .		4
10	Perform experiment to detect object and use buzzer with raspberry pi.		6
Total Hrs			32



❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Introduction to Internet of Things	02(00)	00(00)	00(00)	02(00)
2	Sensors, Actuators & Microcontrollers	02(02)	03(03)	06(00)	11(05)
3	IoT and M2M	02(02)	06(00)	06(06)	14(08)
4	IoT Communication model and protocols	02(02)	03(03)	06(03)	11(08)
5	Hardware element of IoT Arduino & Raspberry Pi	02(00)	03(03)	06(06)	11(09)
6	IoT case studies	02(00)	03(03)	06(03)	11(06)
	Total	12(06)	18(12)	30(18)	60(36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

T- Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Options
1	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	2	R	2	3	R	2	4	R	2										
2	2	U	3	3	U	3	3	U	3	2	U	3	4	U	3				3/5
3	4	U	3	5	U	3	6	U	3	5	U	3	6	U	3				3/5
4	2	A	3	3	A	3	5	A	3	3	A	3	4	A	3				3/5
5	2	A	3	3	A	3	5	A	3	3	A	3	6	A	3				3/5
6	4	A	6	6	A	6	5	A	6										2/3

❖ ASSESSMENT AND EVALUATION SCHEME:-

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assign-ments	15	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	60	24	Theory Answer Scripts	1,2,3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assign-ments	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End of the Course	50	20	Practical Answer Scripts	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Correctness of logic of a program	20
2	Debugging ability	10
3	Quality of input and output displayed (messaging and formatting)	10
4	Submit report in time /Viva Voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	-	-	-	-	-		-	-
2	3	-	-	3	-	-	-	-	3
3	3	-	-	-	-	-	-	-	-
4	3	1	-	3	-	-	3	-	-
5	3	-	1	3	2	2	3	1	3
6	3	-	-	-	2	2	3	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Internet of Things – A Hands on Approach	Arshdeep Bahga and Vijay Madisetti Universities Press	9788173719547
2	A Hands-On Course in Sensors Using the Arduino and Raspberry Pi	Volker Ziemann CRC Press	9781351188296

❖ **E-REFERENCES:-**

- <https://www.youtube.com/watch?v=qQTQcN44UWg&list=PL0s3O6GgLL5cteXH7CJK7kc2Ar5wR7M81&index=8> accessed on 17th February 2022,
- <https://www.youtube.com/channel/UCApUvcyFBwHlAadRsnTmv9w/videos> accessed on 17th February 2022

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

1. Aurdino Board/ Rasberry pi
(Any computer system with basic configuration)
2. Various sensors

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr.M.V.Sarode	Head of Department (Computer Engg.Dept.)	Government Polytechnic Nagpur
2	Mr.A.A.Uike	Lecturer in Computer Engineering	Government Polytechnic Nagpur
3	Mr.M.A.Rahman	Lecturer in Computer Engineering	Government Polytechnic Nagpur
4	Mr.P.S.Thakre	Lecturer in Computer Engineering	Government Polytechnic Nagpur
5	Mr.Dipak Dhote	Operations Manager,	IT-Network Infosystems Pvt LTD, Nagpur
6	Dr.Rakesh Kadu	Assistant Professor, I.T.	Ramdeobaba College of Engg, and Management, Nagpur.
7	Mrs.V.A.Raje	System Analyst	MSBTE,RO Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN COMPUTER ENGINEERING
COURSE CATEGORY	: PROGRAM ELECTIVE COURSE
COURSE CODE	: CM305G
COURSE TITLE	: MOBILE APPLICATION DEVELOPMENT
TEACHING SCHEME	: TH: 03; TU: 00; PR: 02(CLOCK Hrs.)
TOTAL CREDITS	: 04(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs
PT. EXAM	: 01 HR

❖ **RATIONALE:**

Android is the most popular operating system used in the world for mobile platforms. Approximately above 2.8 billion peoples using android mobiles in the world. Android Application Development deals with the process of designing, building, and implementing software applications for mobile platform. After learning this course students will be able to design, develop and deploy basic applications for Android mobiles.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Analyze Mobile Platforms of Android available in Market.
2. Install and Configure Android Application Development Environment.
3. Use Android Application components to handle User interface.
4. Design rich graphical user interface using user interface controls.
5. Develop Android Application using database.
6. Deploy Android applications.

❖ **COURSE DETAILS:****A. THEORY :-**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. Introduction to Android and its Architecture	1a. Classify Android versions with respect to given features. 1b. Describe the characteristics of given Mobile Platform. 1c. Describe given components of Android Architecture. 1d. Compare given android development environment with Android studio and justify.	1.1 Introduction to Android: - History - Versions - Open Handset Alliance 1.2 Characteristics of Androids. other Mobile platforms in market. 1.3 Android Architecture and its Components: - Applications - Application Framework - Libraries - Android runtime - Linux Kernel 1.4 Features of Android Application Integrated Development Environment(IDE): - Android Studio - Eclipse - Visual Studio with Xamarin - NetBeans	06
2. Android Development Environment s	2a. Compare Java SDK and Android SDK on the basis of given features. 2b. Write steps for installation of given IDE. 2c. Use given ADT plugins for designing given User interface. 2d. Compare DVM and JVM based on given points.	2.1 Types of Software development kit(SDK): - Java SDK - Android SDK 2.2 Steps for Installing of Android SDK tools and Android Studio. 2.3 Introduction to Android Development Tools(ADT) plugin and Eclipse. 2.4 Android runtime: Dalvik Virtual Machine(DVM) and Java Virtual machine (JVM)	06
3. Introduction to Android Application Components	3a. Describe given components to handle UI and background Process. 3b. Use given components to handle communication and data. 3c. Apply given Fragment to given activity. 3d. Describe given Components in given application.	3.1 Concept of Activities and Services. 3.2 Concept of Broadcast Receiver: - SMS telephony - Email. Content Provider Methods: - Insert - delete - update 3.3 Introduction to Fragment Fragment Life Cycle	08

		Types of Fragments: • Single Frame • List fragment 3.4 Introduction to • Layouts • Intents • Resources • Manifest	
4. Android User Interface	4a. Select suitable type of Layout for Graphical User Interface (GUI) designing. 4b. Apply suitable attributes to UI layouts. 4c. Use given basic Controls to design GUI. 4d. Choose relevant Controls for given GUI design.	4.1 Introduction to View, View Group. Types of Layouts: Linear, Relative, Table, Absolute, Frame, List view, Grid View 4.2 Layout Attributes. 4.3 UI Controls:-Text View, Edit Text, AutoComplete Text View, Button, Image Button, Toggle Button 4.4 Checkbox, Radio Button, Progress Bar, Date and Time Picker	12
5. Android Activity, Intents, Services and Database	5a. Use given Call back activity methods for android application. 5b. Use given intent action data methods for android application. 5c. Create service using method for given application. 5d. Use database package for handling given SQLite database.	5.1 Concept of Activity:-Activity Life Cycle, Call backs of Activity Class. 5.2 Intent, Intent filter, Action and Data methods 5.3 Introduction to Services: -Features of service, Service Life Cycle, Service Creation Methods. 5.4 Concept of SQLite database: Database package, creation, Insertion and fetching with cursor methods.	08
6. Multimedia, Security and Deployment	6a. Apply methods to use given Multimedia application in Android. 6b. Use the location based service for given application. 6c. Apply custom permission using security model of Android. 6d. Apply steps to publish App in Google Play store.	6.1 Introduction to Multimedia in Android: • Audio Capture • Camera • Bluetooth, • Media Player • Animation 6.2 Location Based Services: MAP display , Navigation, Getting location with data, 6.3 Introduction to Android Security Model, Custom Permissions. 6.4 Application Deployment: Android Development Life Cycle, Google Play Registration, Signing application.	08
Total Hours			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Search and analyze various Mobile platforms with Android.	1. Introduction to Android and its Architecture	02
2	Install and configure Java Development Kit with Eclipse.	2.Android Development Environments	02
3	Install and Configure Android Studio and Android SDK		02
4	Develop a program to display Hello World on screen.	3.Android Application Components	02
5	Develop a program to implement various Layouts.		02
6	Develop a program to implement Content Provider and broadcast receiver.		02
7	Develop a Program to send and Receive SMS and email		02
8	Develop a program to implement Text View and Edit Text.	4. Android User Interface	02
9	Develop a program to implement Auto Complete Text View.		02
10	Develop a program to implement Button Image Button, toggle button and progress Bar		02
11	Develop a program to implement a Login form using various UI Controls.		02
12	Develop a Program to create activity using intent.	5. Android Activity, Intents, Services and Database	02
13	Develop a Program to perform various operations of data with SQLite database.		02
14	Develop a program to implement Animation and Media Player.	6. Multimedia, Security and Deployment	02
15	Interface Bluetooth connection and Camera with android application.		02
16	Develop a Map based application and Deploy.		02
Total Hrs.			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Introduction to Android and its Architecture	02(02)	03(00)	00(00)	05(02)
2	Android Development Environments	02(02)	06(03)	00(00)	08(05)
3	Android Application Components	02(02)	03(03)	06(03)	11(08)
4	Android User Interface	02(00)	06(03)	06(06)	14(09)
5	Android Activity, Intents, Services and Database	02(00)	03(03)	06(03)	11(06)
6	Multimedia, Security and Deployment	02(00)	03(03)	06(03)	11(06)
	Total	12(06)	24(15)	24(15)	60(36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

T- Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1R2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
1	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	2	R	2	3	R	2										
2	1	U	3	2	U	3	3	U	3	2	U	3	3	U	3				3/5
3	2	U	3	4	U	3	5	U	3	4	U	3	3	A	3				3/5
4	4	U	3	6	U	3	3	A	3	5	U	3	5	A	3				3/5
5	3	A	3	5	A	3	5	A	3	6	U	3	6	A	3				3/5
6	4	A	6	6	A	6	4	A	6										2/3

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	15	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	60	24	Theory Answer Scripts	1,2,3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End of the Course	50	20	Practical Answer Scripts	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form		1, 2, 3, 4,5,6	
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Correctness of User Interface Design	10
2	Correctness of Logic	10
3	Debugging Ability	10
4	Appropriateness of output displayed	10
5	Viva voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	-	-	-	-	-	-	-	-
2	3	-	-	-	-	-	3	-	-
3	3	-	-	3	-	-	-	3	
4	-	2	2	3	-	-	-	3	2
5	-	2	2	3	-	-	3	3	2
6	-	-	-	-	-	-	3	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Android	Dikshit Prasanna Kumar, Vikash publication, 2014	9789325977884
2	Android Application Development	Rick Rogers, John Lombardo, O'Reilly, First edition, 2009 e-book	978-0-596-52147-9
3	Android Programming for Beginners	Horten, John packet publication Edition, 2015	978-1-78588-326-2

❖ **E-REFERENCES:**

- <https://www.tutorialspoint.com/android> accessed on 15th December 2021
- <https://www.youtube.com/watch?v=FPtLsZ62pdA&t=1> accessed on 20th December 2021

- E-book: Android Programming Cookbook <https://enos.itcollege.ee/~jpoial/allalaadimised/reading/Android-Programming-Cookbook.pdf> accessed on 20th December 2021

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

1. Computer system (Any computer system which is available in laboratory)
2. Android Studio/SDK , Eclipse ,Database Tool like SQLite

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr. M. V. Sarode	Head of Department (Computer Engg.Dept.)	Government Polytechnic Nagpur
2	Mr. P.S.Thakre	Lecturer in Computer Engineering	Government Polytechnic Nagpur
3	Mrs.D.S.Nalinde	Lecturer in Computer Engineering	Government Polytechnic Nagpur
4	Mrs.C.R.Chaudhari	Lecturer in Computer Engineering	Government Polytechnic Nagpur
5	Mr.Dipak Dhote	Operations Manager,	IT-Network Infosystems Pvt LTD, Nagpur
6	Dr.Rakesh Kadu	Assistant Professor, I.T.	Ramdeobaba College of Engg, and Management, Nagpur.
7	Mrs.V.A. Raje	System Analyst	MSBTE,RO Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : DIPLOMA IN AE/AI/CM/CE/EC/EE/IT/MC/ME/MT/
PK/TX/TR

COURSE CATEGORY: HUMANITIES AND SOCIAL SCIENCE COURSE

COURSE CODE : ES351G

COURSE TITLE : ENTREPRENEURSHIP AND START UP

TEACHING SCHEME : TH: 02; TU: 00; PR: 02 (CLOCK HRS.)

TOTAL CREDITS : 03 (1 TH/TU CREDIT = 1 CLOCK HR., 1PR CREDIT = 2 CLOCK HR.)

TH. TEE EXAM : --

PR. TEE EXAM : --

PT. EXAM : --

RATIONALE:

Entrepreneurship as a mind set and a way of looking toward opportunity, focus and creativity. It's about creating value for customers, investor, entrepreneur, gaining independent in engineering career. Taking bold risk and solving challenges with undefined solution to be an entrepreneur, you need to have the ability to innovate, to improve the old and invent the new. In recent times, our society is influenced by knowledge creation and technological advancements. Competencies affecting Innovation and creativity have become important in all walks of life, including business context. This makes entrepreneurship education even more important for enhancing quality of life. Entrepreneurship plays an influential role in the economic growth and development of the nation. As the world economy is changing so is the dynamism of the business world. The aim of this course is to instil and kindle the spirit of Entrepreneurship amongst students. The idea of this course is to create job providers rather than job seekers.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to

1. Develop Entrepreneurial mindset.
2. Select self-employment as a viable option for earning dignified career.
3. Adapt the dynamic changes happening in the economy to create employment.
4. Prioritize entrepreneurship as life-skills to improve quality of life and skills of creation to start up.

5. Evaluate opportunities for new creation with overall business Potential and weakness.
6. Develop leadership skill particularly in the area of entrepreneur leadership.

❖ **COURSE DETAILS:**

A. THEORY :

Units	Topics and Subtopics	Hrs.
1. Entrepreneurship Concept and Functions	1.1 Introduction to Entrepreneurship, Entrepreneurship – Concept, Functions and Need 1.2 Entrepreneurship – The Indian Scenario. 1.3 Business Environment and Domain knowledge	04
2. An Entrepreneur & Entrepreneurial Journey	2.1 Development of Entrepreneurial skill and inclination towards entrepreneurship. 2.2 Dimension of Entrepreneurship 2.3 Competencies and characteristics for entrepreneur.	05
3. Entrepreneurs-hip as Innovation and Start up	3.1 Entrepreneurs as problem solvers 3.2 Innovations and Entrepreneurial Ventures – Global and Indian 3.3 Idea generation, Incubation centre.	06
4. Understanding the Market	4.1 Market Concept 4.2 Micro and Macro Market Environment 4.3 Market Research – Concept and Marketing Mix	05
5. Business Finance and Project preparation	5.1 Business plan and project 5.2 Feasibility study of the project 5.3 Project report preparation	06
6. Resource Mobilization	6.1 Institutional Infrastructure to promote entrepreneurship 6.2 Selection and utilization of human resources. 6.3 Business Environment and start up	06

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practical	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Outline the success story of any Three entrepreneur from Your Discipline.	1.Entrepreneurship Concept and Functions	02
2	Outline the contribution of SME in GDP of India.	1.Entrepreneurship Concept and Functions	02
3	List out the Barriers faced by entrepreneurship.	1.Entrepreneurship Concept and Functions	02
4	Identify the entrepreneurial traits in students.	1.Entrepreneurship Concept and Functions	04
5	Elaborate the formation of family Business in case study format.	2.An Entrepreneur & Entrepreneurial Journey	02
6	Develop Case study on Technopreneurs like Infosys, UBER, and ZOMATO.	2.An Entrepreneur & Entrepreneurial Journey	06
7	Compose idea generation of new enterprises related to your branch.	3.Entrepreneurship as Innovation and Start up	04
8	Organization of technical feasibility report for the stakeholders and submission for approval.	4.Understanding the Market	04
9	Survey on SSI in your discipline.	5.Business Finance and Project preparation	04
10	List out the facilities and subsidy of SSI unit in your own discipline.	6.Resource Mobilization	02
Total Hrs.			32

❖ **SPECIFICATION TABLE FOR THEORY PAPER: Nil**❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:-Nil**

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	--	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	--	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	Theory Answer Scripts	1,2,3,4,5,6
				Total	--	--		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End of the Course				
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Practical Content	20
2	Entrepreneur Skills Observed	10
3	Result and Conclusion	10
4	Viva Voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	1	2	3
1					3	3	3			
2					3	3	3			
3					3	3	3			
4					3	3	3			
5					3	3	3			
6					3	3	3			

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Entrepreneurship Development and Small Business Management.	Charantimath, P.M.	
2	Entrepreneurship Development in India.	Gupta C.B.	
3	Fundamental of Entrepreneurship and Small Business Management	Himalaya Publishing House.	

❖ **E-REFERENCES:**

1. Harvard Business Review
2. Business India/Business Today/Business World, University News
3. The Journal of Entrepreneurship by SAGE Publisher.
Journals.sagepub.com/home/joe
4. The journal of Entrepreneurship and Innovation in Emerging Economies by SAGE Publisher, journals.sagepub.com/home/eie.
5. International journal of Entrepreneurship and small Business by Inderscience Publisher, www.inderscience.com/ijesb
6. Vikalp Prabandhan

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

Nil

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr.C.P.Kapse	In Charge Head of Deptt, Textile Technology	Government Polytechnic, Nagpur.
2	Dr.G.K.Awari	Head of deptt. , Automobile Engg. Deptt.	Government Polytechnic, Nagpur.
3	Dr.K.S.Dixit	Lecturer, Automobile Engg.Deptt.	Government Polytechnic, Nagpur.

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN COMPUTER ENGINEERING
COURSE CATEGORY	: PROJECT AND INTERNSHIP COURSE
COURSE CODE	: CM351G^{\$}
COURSE TITLE	: PROJECT
TEACHING SCHEME	: TH: 00; TU: 00; PR: 04 (CLOCK HRs.)
TOTAL CREDITS	: 02 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT =2 CLOCK HR.)
TH. TEE EXAM	: --
PR. TEE EXAM	: 02 HR
PT. EXAM	: --

❖ RATIONALE:

The project work is to introduce final year students to professional engineering practices. In project work students are engaged in the analysis, synthesis and application of the courses covered in their studies and to undertake & tackle an independent problem related to Computer Engineering. This course is very useful for understanding the higher level knowledge in the field of Computer engineering.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Carryout market survey /Literature.
2. Select project and Prepare planning.
3. Perform project work independently as a leader and as member of a team.
4. Test project work
5. Prepare project report.
6. Present project report.

❖ **COURSE DETAILS:****A. THEORY :NIL****B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:**

Practi- cals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Perform introductory Task - Form project batch of four-five students - Select project as per area of interest - Select topic / industrial problem / work by consulting the guide from following list 1. Advanced Computer Architecture 2. Artificial Intelligence 3. Automated Software Engineering 4. Business Data Analytics 5. Cloud Computing 6. Computer Networks 7. Computer Security 8. Data Communication 9. Data Compression 10. Data Mining 11. Database Systems 12. Distributed Computing 13. Human Computer Interaction 14. Image Processing 15. Internet and Web Applications 16. Mobile Computing 17. Android Application - Perform Literature Survey - Refer various Periodicals, Journals, Books, - Internet literature related to project topic - Note down findings - Prepare database of collected literature on the basis of title, area of work, methodology used, type of work - Analyze industrial need - Prepare brief report	1. Introductory task and Literature Survey	10
2	Plan project - Prepare Synopsis in standard format which includes following. Title Page: Project Title, Purpose of submission, Institute logo, Students Name, Guide Name, Department and Institute Name - Use Latex for preparing synopsis. - Submit the Synopsis to guide. Approve synopsis from guide	2. Planning	10

	• Prepare action plan of project activities • Submit the action plan to guide • Approve action plan from guide		
3	Perform Project work • Present the overview of the complete system using block diagrams. • Specify design parameters for the system. • Discuss the design and its associated properties. • Discuss all the dependencies in a system design. • Present each module with its associated flowcharts. • Draw E-R Diagrams and Data Flow Diagrams. • Implement the code and give validation rules	3.Project Work	15
4	Test Project work	4. Testing	15
5	Prepare project report in standard format, which includes following. • Title Page which includes: Project Title, Purpose of submission, Institute logo, Students Name, Guide Name, Department and Institute Name • Certificates: Student declaration, Certificate from guide • Acknowledgement • Abstract • Table of contents • List of Tables • List of Figures • List of abbreviations and acronyms (if any) • Text 1. Introduction, objectives 2. Literature Survey 3.Scope of project 4. Methodology/Materials/Methods/Estimate. 5.Detail of Design, working and processes 6. Results and applications 7. Summary/Conclusion and Future scope 8. Appendix(If any). 9. References and Bibliography Use Latex for preparing report. Perform plagiarism check from free internet site. • Submit report of plagiarism check to the guide with project report	5. Project Writing	10

6	Present project work • Prepare power point presentation of work done. • Prepare yourself to handle examiner questions after presentation. • Practice group presentation. • Present before guide	6. Presentation	4
Total Hrs			64

❖ **SPECIFICATION TABLE FOR THEORY PAPER: NIL**

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER : NIL**



❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	--	--	Test Answer Scripts	--
		Class Room Assignments		Assignments	--	--	Assignment Book	--
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	Theory Answer Scripts	--
				Total	--	--	-	--
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	100	--	Project Diary,Notes, Model, Assembly	1, 2, 3,4,5,6
		Journal Writing		Assignments	--	--	Journal	1, 2, 3,4,5,6
				Total	100	40		
	TEE (Term End Examination)	End Exam	Students	End of the Course	100	40	Project Report, Model, Assembly	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Identification of Topic	10
2	Punctuality and overall contribution	
3	Project Diary	
4	Execution of Project Work	20
5	Project Report including documentation	20
6	Presentation	20
7	Question and Answer	30
	TOTAL	100

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	3	-	-	-	3	3	-	3
2	3	3	-	-	-	3	3	-	3
3	3	-	3	3	3	3	3	2	3
4	3	3	3	3	3	3	3	-	3
5	3	3	-	3	3	3	3	2	3
6	3	-	-	3	3	3	3	-	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Computer-Based Construction Project Management	Tarek Hegazy, Pearson Education, Limited, 1 st Edition, 2013	10: 1292027126
2	Successful Project Management: A Step-byStep Approach with Practical Examples	Milton D. Rosenau, Gregory D. Githens, John Wiley & Sons, Inc, 4th Edition, 2013	13: 9780471680321

❖ **E-REFERENCES:**

- http://people.csail.mit.edu/billf/publications/How_To_Do_Research.pdf accessed on 30th January 22
- http://people.csail.mit.edu/billf/publications/How_To_Do_Research.pdf accessed on 30th January 22
- <http://www.duluth.umn.edu/~hrallis/guides/researching/litreview.html> accessed on 30th January 22

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

1. Computer System with latest configuration
2. Latex (for writing project report)

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

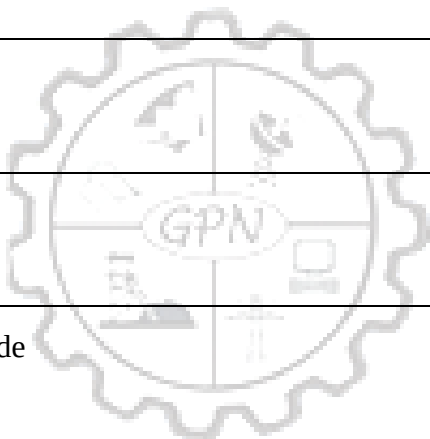
S.N.	Name	Designation	Institute / Industry
1	Dr.M.V.Sarode	HOD.,Computer Engineering	G.P.Nagpur
2	Mrs.D.S.Nalinde	Lecturer in CM	Course Expert G.P.Nagpur
3	Mrs.C.R.Chaudhari	Lecturer in CM	Course Reviewer G.P.Nagpur
4	Mr.S.A.Khatri	Lecturer in CM	Course Reviewer G.P.Nagpur
5	Mr.Dipak Dhote	Operations Manager,	IT-Network Infosystems Pvt LTD,Nagpur
6	Dr.Rakesh Kadu	Assistant Professor, I.T	Ramdeobaba College of Engg, and Management, Nagpur
7	Mrs.V.A.Raje	System Analyst	MSBTE ,RO,Nagpur

 (Member Secretary PBOS)

 (Chairman PBOS)

Appendix
Suggestive Project Diary Format

Week No.:
Activities Planned:
Activities Executed:
Reason for delay if any
Corrective measures adopted
Remark and signature of the Guide

A circular logo with a gear-like outer border. Inside the circle, there are four quadrants, each containing a different icon: a person, a gear, a person, and a gear. In the center of the circle, the letters 'GPN' are written in a stylized font.

GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : DIPLOMA IN CE/ME/EE/EC/CM/IT/AE/MT/PK/TX/
TR/MC/AIML

COURSE CATEGORY : PROJECT AND INTERNSHIP

COURSE CODE :IN351G

COURSE TITLE :INTERNSHIP

TEACHING SCHEME :TH: 00; TU: 00; PR: 30 (CLOCK Hrs.)

TOTAL CREDITS :15 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCKHR.)

Table: Credit framework for Internship.

Sr. No.	Suggested Schedule	Suggested Duration	Activities	Credits
1.	6 th Semester	16 Weeks	Inter/Intra Institutional activities	15
			Industries/Govt./Non-Govt./NGO/ Rural Internship/Innovation/Entrepreneurship/Research Organizations	
			Seminars/Presentations/Internal Evaluation Work	
			Seminars/Presentations/External Evaluation Work	

TH. TEE : --

PR. TEE : 02 HRs

PT. EXAM : --

❖ **RATIONALE:**

Internship is educational and career development opportunity, providing practical experience in a field or discipline. Industrial training is the demonstration of technical knowledge acquired by the students during their course work. This course provides an opportunity to the students to identify and solve real life problem of the industries / research organizations / society. The main aim of this initiative is enhancement of the employability skills of the students passing out from the institute.

The aim of the polytechnic education is to create a pool of skill based manpower to support shop floor and field operations as a middle level link between technicians and engineers. Diploma pass out plays an important role in managing shop-floor operations. Therefore, it is necessary to the diploma pass out to get acquainted with the actual shop floor operations in the industry. This course has been designed to give actual working environment exposure to the diploma students.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Improve career related skills
2. Adopt industrial safety practices
3. Originate survey, related to industrial processes.
4. Appraise industrial working environment.
5. Elaborate Industrial problems
6. Compile, prepare and present report on activities carried out.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
Nil			

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practical No.	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Improve Career related activities • Soft Skills • Presentation skills • Career Guidance • Resume Writing skills • Group Discussion skills • Interview skills • Business Etiquette • Effective Email writing • Telephone etiquette • IT Foundation skills • Do's and Don'ts to be followed in Industry • Safety Practices	Orientation / Training	60
2	Adopt Industrial Safety Practices • Talk to safety officer • Record the safety practices to be followed in industry. • Record Don'ts and Do's. • Follow all instructions.	Safety Practices	60
3	Originate survey, related to the Industrial Process • Collect information regarding various processes carried out in an industry by discussing the allotted supervisor/officer • Note down findings • Prepare brief report	Survey	90
4	Appraise industrial working environment • Follow instructions of supervisor • Observe industrial processes • Record daily work done in diary	Working Experiences	120

❖ **SPECIFICATION TABLE FOR THEORY PAPER:** Not Applicable

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:** Not Applicable

❖ ASSESSMENT AND EVALUATION SCHEME:

☐	What		To Who m	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous)	Progressiv e Test (PT)	Students	Two PT (average of two tests will be computed)	--	--	--	--
		Assignment s		Continuous	--	--	--	--
	TEE (Term End)	End Exam	Stude nts	End of the Course	--	--	--	--
				Total	--	--	--	--
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessemen t of Practical	Students	End of Every week	40	--	Rubrics, Assesseme nt Sheets & Report	1,2,3,4,5,6
		Report Writing		Continuous	10	--	Report	1,2,3,4,5,6
		Presentation and Viva-Voce		End of the Course or last two weeks	50	--	Rubrics, Report & Presentation	1,2,3,4,5,6
				Total	100	40		
	T E E	End Exam	Stude nts	End of the Course	100	40	Rubrics, Report & Presentati on	1, 2, 3, 4,5,6
	Indirect Assessment	Student Feedback on course		Stude nts	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6
End of Course		End of The Course	Questionnaires					

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Selection of industry	10
2	Survey	10
3	Work done and Feasibility of work/ problem identified	20
4	Report writing	10
5	Presentation Skills and Viva-Voce	50
Total		100

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (Cos)	Program Outcomes (POs)							PSOs	
	1	2	3	4	5	6	7	1	2
1	2	-	2	2	3	3	3	3	3
2	2	3	3	3	2	3	3	3	3
3	3	3	3	3	-	2	3	3	3
4	-	2	3	2	-	3	3	3	3
5	2	3	3	2	1	3	3	3	3
6	-	2	2	-	-	3	3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S. N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Industrial Training and Education	Lokesh Choudhary, Mittal Publications, 2007	10: 8183242367 13: 9788183242363
2	Training Practice	Penny Hackett, McGraw-Hill Education, September 2003	10: 0852929803 13: 9780852929803

❖ **E-REFERENCES:**

- <https://learning.tcsionhub.in/courses/career-edge-young-professional/>
- https://www.academia.edu/9360059/INDUSTRIAL_TRAINING_GUIDELINE_BOOK

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

- DLP Projector
- Computers having latest specification

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr. M. V. Sarode	Head of Deptt., Computer Engg. Deptt and TPO	Government Polytechnic, Nagpur.
2	Dr. G. V. Gotmare	Lecturer	Government Polytechnic, Gondia.
3	Mr. Avinash Shende	Managing Director (Operation & Planning)	Virtual Galaxy InfoTech Pvt. Ltd. Nagpur
4	Mr. Sachin Pande	Managing Director (Business Development & Management)	Virtual Galaxy InfoTech Pvt. Ltd. Nagpur
5	Mr. Vijay Thakare	CEO	SimSoft Technologies Nagpur

(Member Secretary PBOS)



(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN AE/ME/CE/EE/PK/MT/TX/IT/CM/ MC/AI/EC/TR
COURSE CATEGORY	: OPEN ELECTIVE COURSE
COURSE CODE	: OE201G
COURSE TITLE	: INDUSTRY 4.0**
TEACHING SCHEME	: TH:02; TU: 00; PR: 00 (CLOCK HRs.)
TOTAL CREDITS	: 02 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 01 HR (Objective Type Online Examination)
PR. TEE EXAM	: ---
PT. EXAM	: 20 Min (Objective Type)

❖ **RATIONALE:**

The course is designed for students to cover the concepts of Industry 4.0 is a novel paradigm for industrial production in which digitization plays a fundamental role. The world is at the onset of the Industrial Revolution and this revolution is very much driven by the smarts in automating decision making and processes. Advancements in IT has resulted in immense improvements in computational power across nearly all electronic devices and enhanced capabilities in connecting the dots in an increasingly networked society. This course provides a comprehensive coverage on, among others, the role of data, manufacturing systems, various Industry 4.0 technologies, applications and case studies.

❖ **COURSE OUTCOMES:**

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

1. Identify the phases for implementing core idea of Industry 4.0
2. Select Proposed Framework for Industry 4.0. based on IoT
3. Apply Proposed Framework for Technology Roadmap used in Harnessing and sharing knowledge in organizations.
4. Select cases studies of Industry 4.0 and Identify the opportunities, challenges brought about by Industry 4.0

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs
1. Introduction to Industry 4.0	1a. Select various Industrial Revolution in the context of Industry 4.0. 1b. Identify the change India is prepared for Industry 4.0 on the given data 1c. Identify Need and challenges of Industry 4.0 on the basis of given points. 1d. Compare Industry 4.0 factory with present factory on the basis of given points. 1e. Identify how Predictive analysis helps many industries to manage resources based on the given data.	1.1 The Various Industrial Revolutions, Core idea of Industry 4.0 • What is Industry 4.0? • Technologies that Drive Industry 4.0 • Challenges for Industry 4.0 1.2 How is India preparing for Industry 4.0 Digitalization and the Networked Economy 1.3 Drivers, Enablers, Compelling Forces and Challenges for Industry 4.0 1.4 Comparison of Industry 4.0 Factory and Present Factory, • Quality 4.0 • Supply Chain 4.0 1.5 Predictive Analytics for Smart Business Transformation • Maintenance 4.0 • Maturity Models for Industry 4.0	08
2. Road to Industry 4.0	2a. Identify the concept of Smart Devices, Products, Smart Logistics and Smart Cities on the given points. 2b. Analyze the concept for Proposed Framework for Industry 4.0 on the basis of given points. 2c. Differentiate technologies of Industry 4.0 and their global forerunners on the basis of given points.	2.1 Smart Manufacturing, Smart Devices and Products, Smart Logistics and Smart Cities • Industrial Control Systems and IIoT • Automation & Software Technologies 2.2 Proposed Framework for Industry 4.0. Four components of Industry 4.0 • Instrumented • Interconnected • Inclusive • Intelligent 2.3 Technologies for enabling Industry 4.0 • IoT • Big data/Industrial Analytics • Cloud Manufacturing • Robotics	06

		• Artificial Intelligence (AI) • Additive Manufacturing	
3. Technology Roadmap for Industry 4.0 And Role of Data, Information , Knowledge and Collaboration in Future Organizations	3a. Identify framework for Technology Roadmap for Industry 4.0 on the basis of given points. 3b. Differentiate Collaborative robots and Universal Robots w.r.t components. 3c. Select the Support System for Industry 4.0 from the given points. 3d. Analyze the concept of Harnessing and sharing knowledge in organizations on the given data.	3.1 Proposed Framework for Technology Roadmap, Strategy Phase • Internal IT roadmap • DevOps roadmap • Infrastructure roadmap • Architecture Roadmap • Software Roadmap • Internal Systems Roadmap • Hardware Procurement Roadmap 3.2 Robotic Automation and Collaborative Robots, Recent Technological Components of Robots (5 important components) • Manipulators • End Effectors • Feedback Devices • Controllers • Locomotive Devices 3.3 Decision Support System for Industry 4.0, Resource-based view of a firm:-Using Microsoft Power BI to implement a decision support system - a Business Intelligence solution data as a new resource for organizations, Harnessing and sharing knowledge in organizations	10
4. Business Issues in Industry 4.0, Case Studies and Augmented Reality in The Age of Industry 4.0	4a. Identify key Opportunities and Challenges in business Industry 4.0 on the given points. 4b. Identify the Skill Key areas for workers in the Industry 4.0 on the basis of given data. 4c. Identify strategies for manufacturing companies to transition to Industry from the given data. 4d. Select the Case studies based on IIoT from the given data. 4e. Identify the Industrial Applications of AR	4.1 Opportunities and Challenges Opportunities • Real-time data • Advanced maintenance and monitoring possibilities • Real-time monitoring, IoT-enabled quality improvement and cobots (collaborative robots) • Superior sustainability and better working conditions • Earn the trust and loyalty the modern consumer with personalization opportunities Challenges • A Gap in Technical Skills • Data Sensitivity • Interoperability • Security • Handling Data Growth	08

	based on the given technology. 4f. Identify the limitation of Industry 4.0 on the basis of given points.	4.2 Future of Works and Skills for Workers in the Industry 4.0 Era 4.3 Strategies for competing in an Industry 4.0 world Types of Competitive Strategy • Cost Leadership • Product differentiation • Customer Relationship Management (CRM) • Cost Focus • Commitment to Customers Strategy 4.4 IIoT case studies • Carnival Corp's Ocean Medallion • Schwering & Hasse's Quality Manufacturing • Samsung and Hipaax's TaskWatch Solution • Caterpillar's Asset Intelligence Platform • Bosch's Nexeed Track and Trace 4.5 AR Hardware and Software Technology, Industrial Applications of AR 4.6 Limitations of Industry 4.0	
		Total	32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Nil

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Introduction to Industry 4.0	01(00)	02(00)	02(00)	05(00)
2	Road to Industry 4.0	01(00)	02(00)	03(01)	06(01)
3	Technology Roadmap for Industry 4.0 and Role of data, information, knowledge and collaboration in future organizations	02(00)	02(01)	05(01)	09(02)
4	Business issues in Industry 4.0, Case Studies and Augmented Reality in the Age of Industry 4.0	02(00)	03(01)	05(01)	10(02)
	Total	06(00)	09(02)	15(03)	30(05)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

T- Unit/Topic Number

L- Level of Question

M-Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Options
Q 01 To Q 35	1	R	1	1	A	1	1	U	1	1	U	1	4	A	1	30/35
	2	R	1	2	U	1	2	U	1	2	A	1	2	A	1	
	2	A	1	2	A	1	3	R	1	3	R	1	3	U	1	
	3	U	1	3	U	1	3	A	1	4	R	1	4	R	1	
	4	U	1	4	U	1	4	U	1	4	U	1	4	A	1	
	4	A	1	4	A	1	4	A	1	4	A	1	1	A	1	
	3	A	1	3	A	1	3	A	1	3	A	1	3	A	1	

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	15	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assign-ments	05	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	30	12	Theory Answer Scripts	1,2,3,4,5,6
				Total	50	20		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	--	--	Journal	
		Journal Writing		Assign-ments	--	--	Journal	
				Total	--	--		
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	Practical Answer Scripts	
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

Nil

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							PSO	PSO	PSO
	1	2	3	4	5	6	7	1	2	3
1	3	3	-	-	-	-	3	-	-	-
2	3	-	-	-	-	-	3	-	-	-
3	3	-	-	-	-	-	3	-	-	-
4	3	3	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Managing Transformation- Objectives to Outcomes	J.Satyanarayana, Prentice Hall, India	13:9788120345379
2	The State, IT and Development.	Kenneth Kenniston, R K Bagga and Rohit Raj Mathur Sage Publications India Pvt. Ltd.	9780761933991
3	e-Government – The Science of the Possible	J.Satyanarayana, Prentice Hall, India	13:9780134195728

❖ **E-REFERENCES:**

- <http://www.csi-sigegov.org/publications.php> accessed on 22/07/2022
- <https://negd.gov.in> accessed on 03/08/2022
- <https://www.nisg.org/case-studies-on-e-governance-in-india> accessed on 04/08/2022

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

1. Computer System with Latest Configuration
2. Internet connectivity
3. Applications developed for accessing different e-governance projects.

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr.M.V.Sarode	Head of Department (Computer Engg.Dept.)	Government Polytechnic Nagpur
2	Mr.M.A.Rahman	Lecturer in Computer Engineering	Government Polytechnic Nagpur
3	Mr.A.A.Uike	Lecturer in Computer Engineering	Government Polytechnic Nagpur
4	Mr.P.S.Thakre	Lecturer in Computer Engineering	Government Polytechnic Nagpur
5	Mr. Dipak Dhote	Operations Manager,	IT-Network Infosystems Pvt LTD, Nagpur
6	Dr.Rakesh Kadu	Assistant Professor, I.T.	Ramdeobaba College of Engg, and Management, Nagpur.
7	Mrs.V.A.Raje	System Analyst	MSBTE,RO Nagpur

 (Member Secretary PBOS)

 (Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN AE/ME/CE/EE/PK/MT/TX/IT/CM/MC/ AI/EC/TR
COURSE CATEGORY	: OPEN ELECTIVE COURSE
COURSE CODE	: OE203G
COURSE TITLE	: INTRODUCTION TO E-GOVERNANCE**
TEACHING SCHEME	: TH:02; TU: 00; PR: 00 (CLOCK HRs.)
TOTAL CREDITS	: 02 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 01 HR (Objective Type Online Examination)
PR. TEE EXAM	: ---
PT. EXAM	: 20 Min (Objective Type)

❖ **RATIONALE:**

The course is designed for students to cover the concepts of e-Governance and to understand how technologies and business models shape the contours of government for improving citizen services and bringing in transparency.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Identify the concepts, terminology and technology of e-government.
2. Develop environment for promoting Digital System Infrastructure and National Data Warehouses.
3. Apply the knowledge of Cyber Laws and security.
4. Use Architecture and models of e-governance for innovation and change management.
5. Identify Challenges and Approach of E-government Security.
6. Analyze using available tools the given case studies of e-governance.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. Introduction to E-Governance	1a. Identify Need of E-Governance from the given points. 1b. Identify the factors for global trends of growth in E-Governance from the given points. 1c. Analyze the model of Digital Governance from the given data. 1d. Select the Maturity Models of E-Governance from the given points.	1.1 Needs of E-Governance, Issues in E-Governance applications and the Digital Divide; Evolution of E-Governance, its scope and content 1.2 Present global trends of growth in E-Governance and related issues. 1.3 Models of E-Governance: Introduction; Model of Digital Governance: Broadcasting/ Wilder Dissemination Model, Critical Flow Model, Comparative Analysis Model, Mobilization and Lobbying Model, Interactive-service Model/Government-to-Citizen-to-Government Model (G2C2G) 1.4 Evolution in E-Governance and Maturity Models: Five Maturity Levels, Characteristics of Maturity Levels, Difference between E-governance and E-government	06
2. E-Governance Infrastructure and Strategies	2a. Differentiate between Digital system and Traditional system on the basis of given points. 2b. Choose the concepts of National Data Warehouses with Data Warehousing and Data Mining from the given points.	2.1 E-readiness, Digital System Infrastructure, Legal Infrastructure, Preparedness, Institutional Infrastructure, Preparedness, Human Infrastructure, Preparedness, Technological Infrastructure, Preparedness System Calls-Concept, types of system calls. 2.2 Introduction to National Data Warehouses: Census Data, Prices of Essential Commodities; Other areas for Data Warehousing and Data Mining..	05
3. Cyber Security in E-Governance	3a. Select threats and Assessing damages in cyber security based on given characteristics. 3b. Identify the need of Security in Mobile	3.1 Cyber Security: Information System Threats and attacks, Classification of Threats and Assessing Damages . 3.2 E-Government key Security Challenges (Network Security, Identification, Access Control,	05

	and Wireless computing based on given data. 3c. Analyze the security framework for given organization on the given points. 3d. Identify the need of security metrics on the basis of given points.	Usability), 3.3 Security Implication key Organizations, Laptops Security Framework for Information Security. 3.4 Security Metrics Information Security Vs Privacy, Basic Principles of Information Security, Confidentiality, integrity Availability in Information Security, information Classification and their Roles	
4. Architecture and Models of e-governance	4a. Select the PPP Architecture of e-governance Model from the given points. 4b. Identify the need for innovation and change management in e-governance. 4c. Identify the issues related with corruption in e-governance.	4.1 Architecture and models of e-governance i.e. The Broadcasting Model, Critical Flow Model including Public Private Partnership (PPP).. 4.2 Need for innovation and change management in e-governance 4.3 Major issues including corruption in e-governance .	04
5. Digital India and Security for e-Government	5a. Identify various key vision areas of Digital India. 5b. Analyze the concept of nine pillars of Digital India. 5c. Determine the strategies to create own Digital Lockers and e-sign. 5d. Identify the Security Management Model based on the Security Standards.	5.1 Digital India : the Umbrella Programme, Key Vision Areas, Participation in digital & financial space through mobiles and Banking . 5.2 Nine pillars of Digital India, e-Governance related Policies, Digital Lockers and e-Sign 5.3 Challenges and Approach of E-government Security. 5.4 Security Management Model	06
6. Case Studies in e-Governance	6a. Analyze different Laws of e-Governance in the Indian Context. 6b. Select case studies in e-governance based on Services provided by NIC. 6c. Identify the Role of NIC center of the	6.1 Indian Context: Cyber Laws, Implementation in the Land Reform, Human Resource Management Software. 6.2 NIC-NET, Collectorate, Computer-aided Administration of Registration Department (CARD), Smart Nagarpalika, National Reservoir Level and Capacity Monitoring System,	06

	district from the given.	Computerization in Maharashtra, Ekal Seva Kendra, Sachivalaya Vahini, Bhoomi, IT in Judiciary, E-Khazana, Directorate General of Foreign Trade (DGFT), PRAJA, E-Seva, E-Panchyat. 6.3 General Information Services of National Informatics Centre (NIC).	
		Total Hrs	32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Nil

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Introduction to E-Governance	02(00)	02(00)	00(00)	04(00)
2	E-Governance Infrastructure and Strategies	01(00)	02(00)	02(01)	05(01)
3	Cyber Security in E-Governance	01(00)	01(00)	04(01)	06(01)
4	Architecture and models of e-governance	00(00)	02(01)	03(00)	05(01)
5	Digital India and Security for e-Government	01(00)	02(00)	03(01)	06(01)
6	Case Studies in e-governance	01(00)	00(01)	03(00)	04(01)
	Total	06(00)	09(02)	15(03)	30(05)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

T- Unit/Topic Number

L- Level of Question

M-Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Options
Q 01 To Q 35	1	R	1	1	R	1	1	U	1	1	U	1	2	R	1	30/35
	2	U	1	2	U	1	2	A	1	2	A	1	2	A	1	
	3	R	1	3	U	1	3	A	1	3	A	1	3	A	1	
	3	A	1	3	A	1	4	U	1	4	U	1	4	U	1	
	4	A	1	4	A	1	4	A	1	5	R	1	5	A	1	
	5	U	1	5	U	1	5	A	1	5	A	1	5	A	1	
	6	R	1	6	U	1	6	A	1	6	A	1	6	A	1	

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	15	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assign-ments	05	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	30	12	Theory Answer Scripts	1,2,3,4,5,6
				Total	50	20		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	--	--	Journal	
		Journal Writing		Assign-ments	--	--	Journal	
				Total	--	--		
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	Practical Answer Scripts	
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form		1,2,3,4,5,6	
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

Nil

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							PSO	PSO	PSO
	1	2	3	4	5	6	7	1	2	3
1	3	3	3	3	-	-	3	3	-	-
2	3	3	-	-	-	-	3	-	-	-
3	3	-	3	3	-	-	-	3	-	-
4	3	3	3	3	-	-	3	3	-	-
5	3	3	3	3	-	-	-	3	-	-
6	3	3	3	-	-	-	-	3	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N .	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Managing Transformation-Objectives to Outcomes	J Satyanarayana, Prentice Hall, India	13:9788120345379
2	The state, IT and Development.	Kenneth Kenniston, R K Bagga and Rohit Raj Mathur Sage Publications India Pvt. Ltd.	9780761933991
3	e-Government – The Science of the Possible	J Satyanarayana, Prentice Hall, India	13:9780134195728

❖ **E-REFERENCES:**

- <https://www.csi-sigegov.org.in/publications.php> accessed on 22/06/2022
- <https://negd.gov.in> accessed on 27/07/2022
- <https://www.nisg.org> accessed on 03/08/2022

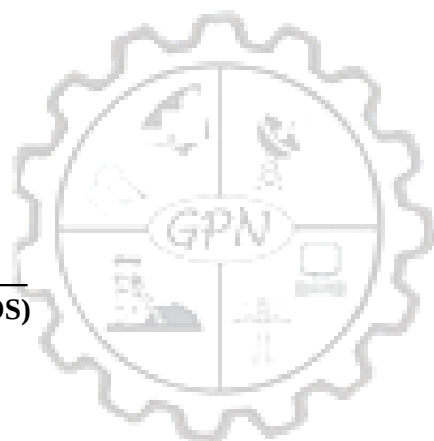
❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

NIL

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr.M.V.Sarode	Head of Department (Computer Engg.Dept.)	Government Polytechnic Nagpur
2	Mr.M.A.Rahman	Lecturer in Computer Engineering	Government Polytechnic Nagpur
3	Mr.A.A.Uike	Lecturer in Computer Engineering	Government Polytechnic Nagpur
4	Mr.P.S.Thakre	Lecturer in Computer Engineering	Government Polytechnic Nagpur
5	Mr. Dipak Dhote	Operations Manager,	IT-Network Infosystems Pvt LTD, Nagpur
6	Dr. Rakesh Kadu	Assistant Professor, I.T.	Ramdeobaba College of Engg, and Management, Nagpur.
7	Mrs.V.A.Raje	System Analyst	MSBTE,RO Nagpur

(Member Secretary PBOS)



(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : DIPLOMA IN AE/ME/CE/EE/PK/MT/TX/IT/CM/MC/
AI/EC/TR

COURSE CATEGORY: OPEN ELECTIVE COURSE

COURSE CODE : OE204G

COURSE TITLE : CYBER SECURITIES AND LAWS**

TEACHING SCHEME: TH: 02; TU: 00;PR: 00 (CLOCK HRs.)

TOTAL CREDITS : 02(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)

TH. TEE EXAM : 01HR (Objective Type Online Examination)

PR. TEE EXAM : --

PT. EXAM : 20 MINUTES (Objective Type)

❖ RATIONALE:

The increase of internet use is leading towards the frauds/ illegal activities on the internet. It is need of time to understand the various cyber crimes and importance of Cyber Securities in order to protect personal, governmental, organisational property/ data/information systems. Also it is need to understand various cyber laws/ laws of internet, that are deals with crimes related to cyber space.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Identify different types of cyber organized crime.
2. Analyze the planning, risk events and concept of cyber attacks.
3. Identify the tools that used in cyber crimes.
4. Identify types of Cybercrimes related with mobile and wireless Devices.
5. Analyze the conceptual foundation of cyber security awareness.
6. Identify different laws and concepts of Cyber security .

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. Introduction to Cyber Crime	1a. Choose the meaning of given term. 1b. Identify criminals, that are related with given cyber crimes. 1c. Identify a type of cybercrime done in given statements.	1.1 Cyber Crime: Definitions, An origin of the Word, cybercrime and information security, email bombing, mail bombs 1.2 Criminals in cybercrime, classification of cyber-crimes; cyber defamation, internet time theft 1.3 Hacking, online fraud, software piracy, 1.4 password sniffing, Identity theft	04
2. Planning of Cyber Attack	2a. Select type of cyber-attacks in given statement. 2b. Choose features of social engineering. from given statements. 2c. Select from given statements, that showing cyber stalking. 2d. Analyse given statements and Identify use of cloud computing in cybercrime.	2.1 Attacks: passive and active attacks, scamming/scrutinizing gathered information, attack Gaining/maintaining the system access, 2.2 Social engineering, classification of social engineering, 2.3 Cyber stalking: types of stalkers, stalking of cyber stalking, Real life incidents of cyber stalking, 2.4 Cloud computing: why cloud computing? types of services, cyber-crime and cloud computing..	06
3. Tools and Methods Used in Cyber Crime	3a. Analyse given statements and Identify role of proxy servers in cyber crimes. 3b. Identify strong passwords and weak passwords from given samples of password. 3c. Identify types of virus used for given cyber crimes. 3d. Identify used fishing method in given cyber crime.	3.1 Introduction proxy servers 3.2 Password cracking - online attacks, offline attacks, strong, weak and random password, random password, 3.3 Virus and worms, types of virus, Trojan horse and backdoors: backdoors, protection from Trojan horse, 3.4 Phishing –Definition, methods of phishing, types of phishing scams,	04

4. Cyber Crime: Mobile/Wireless Devices	4a. Identify technique used for given cyber crime. 4b. Select from given statements, that showing API security for mobile devices. 4c. Select from given statements that can be possibility of cybercrime for mobile devices. 4d. Identify measures for protecting data on lost devices from given statements.	4.1 Credit card/debit card fraud in mobile and wireless computing eratypes and technique of credit card fraud, 4.2 Mobile devices: Media player control security, networking API security for mobile devices 4.3 Applications and software :mobile viruses, Securities from mobile computing applications, hacking Bluetooth mobile devices, 4.4 A Threats through stolen devices, Protecting data on lost devices, device related security issues, organizational security policies and measures in mobile computing era.	06
5. Cyber Crimes and Need for Cyber-Security	5a. Analyze given statements and identify performed online cybercrime. 5b. Analyse given statements and select type of cybercrime related with given sector. 5c. Identify use of patents and trademarks from given statement. 5d. Analyze given statements and select importance/need of cyber laws from given options.	5.1 Online Scams: Charity scam, lottery Scam, Fake offer/fake job scam 5.2 Examples of cyber-crimes: Indian case of online gambling, banking related frauds 5.3 Intellectual Property in Cyber space, Patent copyright, trademark, domain name 5.4 The legal Scenario and perspectives - Introduction, cybercrime and the legal base for cybercrime around world, Importance and need cyber laws	06
6. Cyber Laws and Way Forward	6a. Analyze given statements and select feature relevant with IT Act 2000. 6b. Select from given options that denotes the various changes made in IT ACT. 6c. Identify challenges of Indian law and cybercrime in India, from given statements.	6.1 Cyber laws in INDIA:IT ACT-2000, Positive aspects of IT ACT 2000, Weak areas in IT ACT 2000 6.2 Amendments In cyber laws: changes made in IT ACT, state Government's power impacted by amendment in IT ACT 6.3 Challenges : challenges of Indian law and cyber-crime scenario in India, Information Technology ACT and its influence, digital signature and the Indian ACT,	06

	6d. Identify from given statements that denotes punishment for given Cybercrime.	6.4 Punishment: cybercrime and punishment, Information technology and students technology and students: An Indian Scenario	
Total Hrs.			32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

	NIL		
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❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Introduction	02(01)	02(00)	01(00)	05(01)
2	Planning of cyber Attack	01(00)	02(00)	02(01)	05(01)
3	Tools and methods used in Cyber crime	01(00)	01(00)	03(01)	05(01)
4	Cyber Crime: Mobile/wireless devices	01(00)	01(00)	03(01)	05(01)
5	Cybercrimes and need for Cyber-security	02(00)	01(00)	02(00)	05(00)
6	Cyber Laws and Way forward	01(00)	02(01)	02(00)	05(01)
	Total	08(01)	09(01)	13(03)	30(05)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

T-Unit/Topic Number

L- Level of Question

M-Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R1 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 1 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Options
Q.NO.01- Q.NO.35	1	R	1	1	R	1	1	U	1	1	U	1	1	A	1	1	R	1	30/35
	2	R	1	2	U	1	2	U	1	2	A	1	2	A	1	2	A	1	
	3	R	1	3	U	1	3	A	1	3	A	1	3	A	1	3	A	1	
	4	R	1	4	U	1	4	A	1	4	A	1	4	A	1	4	A	1	
	5	R	1	5	R	1	5	U	1	5	A	1	5	A	1	6	R	1	
	6	U	1	6	U	1	6	A	1	6	A	1	6	U	1				

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	15	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	05	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	30	12	Theory Answer Scripts	1,2,3,4,5,6
				Total	50	20		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	-	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assignments	-	--	Journal	1, 2, 3,4,5,6
				Total	-	-		
	TEE (Term End Examination)	End Exam	Students	End of the Course	-	-	Practical Answer Scripts	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form		1, 2, 3, 4,5,6	
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

	Nil	
--	-----	--

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	1	2	3
1	3	3	-	-	2	-	3	-	-	-
2	3	3	-	-	2	-	3	-	-	-
3	3	3	-	-	2	-	3	-	-	-
4	3	2	-	-	2	-	3	-	-	-
5	3	2	-	-	2	-	3	-	-	-
6	3	2	-	-	2	-	3	-	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	"Cyber Security" - Understanding Cybercrime, Computer forensic and legal perspective.	Nina Godbole, Sunil Belapure, Wiley India Pvt. Ltd Reprint, 2018	978-81-265-2179-1
2	"Cyber security Managing systems- Conducting, Testing and Investigating Intrusion",	Thomas J. Mowbray, Wiley India Pvt. Ltd Reprint, 2018	81-219-2440-5

❖ **E-REFERENCES:**

- <https://www.youtube.com/watch?v=KqSqyKwVuA8> accessed on 25th January 2022
- <https://www.youtube.com/watch?v=PIHnamdwGmw> accessed on 27th January 2022
- <https://www.youtube.com/watch?v=fQ3ESFfvchg&list=PLUtfVcbiqn834VGI9faVXGIGSDXZMGp8> accessed on 27th January 2022

❖ **LIST OF MAJOR EQUIPMENTS / INSTRUMENTS WITH SPECIFICATION:**

Nil

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr.A.R.Mahajan	Head of Department (I.T.Dept.).	Government Polytechnic, Nagpur.
2	Mr.L.L.Bhadekar	Lecturer in IT	Government Polytechnic, Nagpur.
3	Mrs.Shifa Mohammed Azharuddin	Lecturer in IT	Government Polytechnic, Nagpur.
4	Mr. Dipak Dhote, Industry Expert	Operations Manager, IT-Network Infosystems Pvt. LTD.	IT-Network Infosystems Pvt. LTD.
5	Dr. Rakesh Kadu, Member from Academics(External)	Assistant Professor, I.T., Ramdeobaba College of Engg. and Management, Nagpur.	Ramdeobaba College of Engg. and Management, Nagpur.
6	Mrs.V.A. Raje,MSBTE Nominee	Lecturer in C.O., G.P. Arvi	G. P. Arvi
7	Mr. L.D.Vilhekar, Member (Internal)	Lecturer in Information Tech.	Government Polytechnic, Nagpur.
8	Mrs.D.P.Chanmanwar, Member (Internal)	Lecturer in Information Tech.	Government Polytechnic, Nagpur.
9	Mr.M.N.Gawande, CDC In Charge and Member Secretary	Lecturer in Electrical Engg.	Government Polytechnic, Nagpur.

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CE/EE/EC/CM/IT/MT/MC/PK/AE/TR/TX
COURSE CATEGORY	: OPEN ELECTIVE COURSE
COURSE CODE	: OE206G
COURSE TITLE	: ENERGY WASTE MANAGEMENT**
TEACHING SCHEME	: TH:02; TU: 00;PR: 00(CLOCK HRs.)
TOTAL CREDITS	: 02(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 02 HRs (Online Examination)
PR. TEE EXAM	: --
PT. EXAM	: 20 Min(MCQ)

❖ RATIONALE:

The objective of the course is to provide insight into waste management options by reducing the waste destined for disposal and encouraging the use of waste as a resource for alternate energy production. This course is designed to provide an understanding of the various aspect of waste to Energy. The various sources of waste generation is analyzed with a focus on its potential for energy production. The need for characterization of waste will be discussed along with the existing norms for waste utilization for alternate energy source. Case studies will be discussed to provide a better understanding of the concept of “Waste to Energy “in the Indian context.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Identify sources of waste energy in various field
2. Choose appropriate process of heat recovery from waste energy in various field
3. Apply the concept of waste to energy in various field of engineering
4. Analyze the present scenario of conventional and non conventional energy in India.
5. Identify the environment friendly technologies to manage waste energy
6. Analysis of case studies for understanding success and failures.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. Introduction	1a. Define Principle of waste management 1b. Describe 3-R Principle of waste management. 1c. List different sources of waste energy in different sector	1.1 Principle of waste management and waste utilization 1.2 3-R Principle of waste management, • Reduce • Reuse and • Recycle 1.3 Sources waste energy such as domestic, industrial, agriculture, post-consumer waste etc.	04
2. Conversion of Waste to Energy	2a. Describe biochemical conversion 2b. Explain Thermo chemical conversion 2c. Identify sources of heat recovery from boiler	2.1 Bio chemical Conversion, energy production from organic waste through anaerobic digestion and fermentation 2.2 Thermo chemical Conversion – Combustion incineration and heat recovery pyrolysis, gasification. 2.3 Waste heat recovery from boiler	06
3. Waste heat Recovery , Cogeneration and Trigeneneration	3a. State need of waste heat recovery of the given thermal power plant 3b. Illustrate with neat sketches working principle of cogeneration and trigeneneration	3.1 Construction and working of thermal power plant and waste heat recovery in thermal power plant : need, opportunities and present practices 3.2 Cogeneration and Trigeneneration: need, opportunities and present practices	06
4. Renewable Sources of Energy	4a. List different sources of renewable energy. 4b. Compare energy consumption in India by conventional and non conventional energy	4.1 Introduction to renewable source of energy and different sources of renewable energy likesolar, wind, tidal, geothermal etc. 4.2 Present scenario of conventional and non conventional energy in India	06
5. Waste to Energy and Environmental Implication	5a. State standards for Environment standard 5b. List benefits of non renewable energy 5c. State importance of Carbon Credit	5.1 Environmental standards for waste to energy 5.2 Saving on non renewable fuel resources 5.3 Introduction to carbon credit	05

6. Case Study. (Scenario of Waste to Energy)	Case Studies –(on any one topic) 6a. Success/failures of Indian waste to energy Plants 6b. Global Best Practices in Waste to energy production distribution and use. 6c. Indian Scenario on Waste to Energy production distribution and use in India. 6d. Role of the Government in promoting 'Waste to Energy	6.1 Success/ failure waste to energy 6.2 Global based practices in waste to energy production, distribution and use 6.3 Indian Scenario on waste to energy 6.4 Role of government in promoting waste to energy (Case study on the basis of waste to energy)	05
Total Hrs			32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS: Nil**❖ SPECIFICATION TABLE FOR THEORY PAPER:**

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Introduction.	00(00)	04(00)	00(00)	04(00)
2	Conversion of Waste to Energy	00(00)	03(00)	03(00)	06(00)
3	Waste Energy utilization in power plant	02(00)	04(00)	00(02)	06(02)
4	Renewable sources of Energy	00(01)	00(00)	04(00)	04(01)
5	Waste to Energy and Environmental Implication	00(00)	00(02)	05(00)	05(02)
6	Case Study.	00(00)	00(00)	05(00)	05(00)
	Total	02(01)	11(02)	17(02)	30(05)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Options
Q.01 to Q.35	1	U	1	1	A	1	1	U	1	1	U	1	1	U	1	30/35
	2	U	1	2	U	1	2	A	1	2	A	1	2	A	1	
	3	R	1	3	R	1	3	U	1	3	A	1	3	U	1	
	4	R	1	4	A	1	4	A	1	4	A	1	4	A	1	
	5	A	1	5	A	1	5	U	1	5	A	1	5	A	1	
	6	A	1	6	A	1	6	A	1	6	A	1	6	A	1	

T-Unit/Topic Number
R-RememberL- Level of Question
U-UnderstandM- Marks
A-Analyze/ Apply

ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	15	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	05	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	30	12	Theory Answer Scripts	1,2,3,4,5,6
				Total	50	20		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	--	--	--	--
		Journal Writing		Assignments	--	--	--	--
				Total	--	--		
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	--	--
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
	Nil	

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							PSO	PSO
	1	2	3	4	5	6	7	1	2
1	3	3	-	-	3	-	3	3	-
2	3	3	3	-	3	-	3	3	-
3	3	3	3	-	3	-	3	3	-
4	3	3		-	3	-	3	3	-
5	3	3	3	-	3	-	3	3	-
6	3	3	3	-	3	1	3	3	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

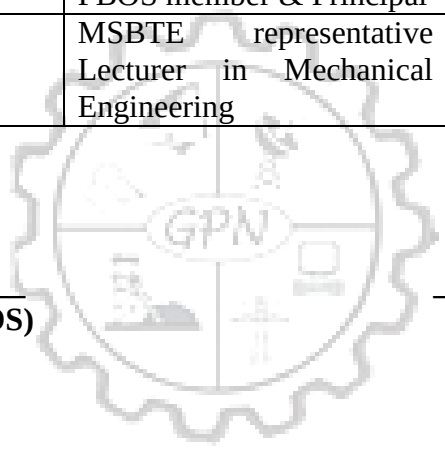
S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Integrated Waste Management in India. Status and Future Prospects for Environmental Sustainability.	Marimuthu Prashanthi, Rajakumar Sundaram.	978-3319272269
2	Solid Waste Management Present and future challenges	Jagbir Singh, AL. Ramanathan	978-9389447927
3	Solid Waste Management in Indian Cities: Status and Emerging Practices	Darshini Mahadevia, Jeanne M. Wolfe	978-818069522
4	Renewable energy sources and Emerging Technologies	D.P.Kothari, K.C. Singal, Rakesh Ranjan	978-9389347890
5	Thermal Engineering	R.S.Khurmi , J.K.Gupta	978-8121925730
6	Thermal Engineering	R.K.Rajput	978-8131808047

❖ **E-REFERENCES:**

- <https://www.youtube.com/watch?v=HA3pjuUMVY0>
- <https://www.youtube.com/watch?v=XHi7kV-ZMT0>
- <https://www.youtube.com/watch?v=DROZUstnsnw>
- <https://www.youtube.com/watch?v=1w9Qp61BsNg>
- www.teriin.org/projects/green/pdf/National-Waste.pdf

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr. R. G. Choudhari	HOD, Mechanical Engineering	Government Polytechnic, Nagpur
2	Mr. T. K. Ghormade	Course Expert & Lecturer in Mechanical Engineering	Government Polytechnic, Nagpur
3	Dr. M. M. Pawde	Course Expert & Lecturer in Mechanical Engineering	Government Polytechnic, Nagpur
4	Er. A. M. Onkar	PBOS member & Chief Executive Officer	Onkar Furnitures, MIDC, Nagpur
5	Shri. G. F. Potbhare	PBOS member & Principal	NIT, Polytechnic, Nagpur
6	Shri G. H. Dahole	MSBTE representative Lecturer in Mechanical Engineering	Govt. Polytechnic, Gondia



 (Member Secretary PBOS)

 (Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CE/EE/EC/CM/IT/MT/MC/PK/AE/TR/TX
COURSE CATEGORY	: OPEN ELECTIVE COURSE
COURSE CODE	: OE207G
COURSE TITLE	: TOTAL QUALITY MANAGEMENT**
TEACHING SCHEME	: TH:02; TU: 00;PR: 00(CLOCK HRs.)
TOTAL CREDITS	: 02(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 02 HRs (Online Examination)
PR. TEE EXAM	: --
PT. EXAM	: 20 Min (MCQ)

❖ RATIONALE:

The success of any organization not only depends on quality of its products and services but also depends on the people working in it. Total quality management (TQM) is a philosophy, methodology aimed to create and maintain mechanism of organization's continuous improvement to achieve total quality. This course deals with the methods through which the needs and expectations of the customer and the objectives of the organization are satisfied in most efficient and cost-effective manner. After studying this course, the diploma technicians shall be able to improve and maintain the quality of products and services through ongoing refinements in the organization he/she serving.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Describe the dimensional barrier regarding Quality.
2. Summarize the Total quality principles.
3. Demonstrate the tools utilization for quality improvement.
4. Discover the new decision of principle in real time projects.
5. Analyze the various types of techniques used to measure quality.
6. Apply the various quality systems in implementation of TQM.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. Introduction to TQM	1a. Describe evolution of quality 1b. Identify concepts of TQM 1c. Illustrate barriers while implementing TQM	1.1 Introduction - Need for quality - Evolution of quality - Definition of quality 1.2 Dimensions of manufacturing and service quality - Basic concepts of TQM - Definition of TQM – 1.3 TQM Framework - Contributions of Deming, Juran and Crosby, Component of TQM, Obstacles to Quality	06
2. TQM Principles	2a. Describe leadership and quality aspects 2b. Describe roll of employee in TQM. 2c. Describe various continuous improvement processes. 2d. Describe the term supplier and justify how supplier rating.	2.1 Leadership – Strategic quality planning, Quality statements - Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention – 2.2 Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal 2.3 Continuous process improvement – PDCA cycle, 5s, Kaizen 2.4 Supplier partnership – Partnering, Supplier selection, Supplier Rating.	05
3. TQM Tools and Techniques – I	3a Describe tools of quality. 3b Describe six sigma process. 3c State applications of Six sigma 3d Justify benchmarking and describe it.	3.1 The seven traditional tools of quality – New management tools. 3.2 Six-sigma – Concepts, methodology, applications to manufacturing, service sector. 3.2 Bench marking –Reason to bench mark, Bench marking process	05
4. TQM tools and Techniques – II	4a. Describe Quality circle, QFD, Taguchi quality loss function and TPM 4b. Describe performance measure and improvement needs 4c. State the Method of Fish Bone as decision making model 4d. Demonstrate problem solving with the use	4.1 Quality circles – Quality Function Deployment (Introduction) TPM Concepts (Introduction), 4.2 Quality improvement needs –JIT, Cost of Quality – Performance measures. 4.3 Various TQM tools: Cause-and-effect diagram (fishbone or Ishikawa diagram), Check sheet, Histogram, Pareto chart	05

	of quality tools		
5. Quality Systems	5a Justify need of quality system ISO 9000 5b Describe quality auditing QS 9000. 5c List factors responsible for TQM implementation in manufacturing and service sector.	5.1 Need for ISO 9000- ISO 9000-2000 Quality System, Eight principles of ISO 5.2 Quality auditing, QS 9000, ISO 14000 – Concepts, 5.3 Requirements and Benefits – Case studies of TQM implementation in manufacturing and service sectors	05
6. Implementation of TQM	6a. State scope of total quality implementation. 6b. Describe achievements through TQM 6c. Describe need of multi skilled worker, YO-I-DON 6d. Justify importance of KANBAN system, in quality.	6.1 Road map for TQM Implementation. 6.2 Lean Manufacturing (Introduction), Productivity –Seven Deadly Wastes 6.3 Single unit production "YO-I-DON" & standardization, Need of multi-skilled worker. 6.4 Quality production through KANBAN system and KANBAN rules.	06
Total Hrs			32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Nil

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Introduction to TQM	00(00)	04(00)	00(00)	04(00)
2	TQM Principles	00(00)	03(00)	03(00)	06(00)
3	TQM tools and Techniques – I	02(00)	04(00)	00(02)	06(02)
4	TQM tools and Techniques - II	00(01)	00(00)	04(00)	04(01)
5	Quality Systems	00(00)	00(02)	05(00)	05(02)
6	Implementation of TQM	00(00)	00(00)	05(00)	05(00)
	Total	02(01)	11(02)	17(02)	30(05)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Options
Q.01 to Q.35	1	U	1	1	A	1	1	U	1	1	U	1	1	U	1	30/35
	2	U	1	2	U	1	2	A	1	2	A	1	2	A	1	
	3	R	1	3	R	1	3	U	1	3	A	1	3	U	1	
	4	R	1	4	A	1	4	A	1	4	A	1	4	A	1	
	5	A	1	5	A	1	5	U	1	5	A	1	5	A	1	
	6	A	1	6	A	1	6	A	1	6	A	1	6	A	1	

T-Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 1means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 1 Marks

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	15	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	05	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	30	12	Theory Answer Scripts	1,2,3,4,5,6
				Total	50	20		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	--	--	--	--
		Journal Writing		Assignments	--	--	--	--
				Total	--	--		
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	--	--
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3,4,5,6
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Nil	

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							PSO	PSO
	1	2	3	4	5	6	7	1	2
1	3	3	-	-	3	-	3	3	-
2	3	3	3	-	3	-	3	3	-
3	3	3	3	-	3	-	3	3	-
4	3	3		-	3	-	3	3	-
5	3	3	3	-	3	-	3	3	-
6	3	3	3	-	3	2	3	3	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	TQM-Total Quality Management	Arasu Senthil B, Paul Praveen I Scitech Publications (India) Pvt. Ltd., Chennai, 2015	ISBN: 978-81-8371-578-2
2	Quality Assurance and Total Quality Management (ISO-9000, QS-9000, ISO-14000)	Jain K C, Chitale A K Khanna Publishers, New Delhi, 2005,	ISBN: 9788174091741
3	TQM and ISO 14000	Arora K C S.K. Kataria & Sons, New Delhi 2014,	ISBN: 9788185749990
4	Quality Management for Organizational Excellence: Introduction to Total Quality, 8th Ed	Goetsch & Davis, Publisher: Prentice Hall	ISBN: 978-0-13-379185-3

❖ **E-REFERENCES:**

- <https://www.versesolutions.com/>
- <https://www.asq.org/learn-about-quality/total-qualitymanagement/overview/>
- <https://www.hgint.com/tqm-total-quality-management-software/>
- <https://www.books.google.co.in/books?isbn=817758412X>
- <https://www.www.educba.com> > Courses > Business > Management
- <https://www.managementhelp.org/quality/total-quality-management.htm>

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Prof. P. V. Rekhade	HOD, Mechanical Engineering	Government Polytechnic, Nagpur.
2	Dr. R. G. Choudhari	HOD, Mechanical Engineering	Government Polytechnic, Nagpur
3	Mr.S. R. Kaduskar	Course Expert & Lecturer in Mechanical Engineering	Government Polytechnic, Nagpur.
4	Mr. A.S. Bahendwar	Course Expert & Lecturer in Mechanical Engg	Government Polytechnic, Nagpur.
5	Mr.S. B. Bambole	Course Expert & Lecturer in Mechanical Engg	Government Polytechnic, Nagpur.
6	Er. Mr. A.M.Onkar	PBOS member & Chief Executive Officer	Onkar Furnitures, MIDC, Nagpur
7	Shri. G.F.Potbhare	PBOS member & Principal	NIT, Polytechnic, Nagpur
8	Shri G.H. Dahole	MSBTE representative Lecturer in Mechanical Engineering	Govt. Polytechnic, Gondia

(Member Secretary PBOS)

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GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN AE/ME/CE/EE/PK/MT/TX/IT/CM/ MC/AI/EC/TR
COURSE CATEGORY	: OPEN ELECTIVE COURSE
COURSE CODE	: OE208G
COURSE TITLE	: ADDITIVE MANUFACTURING & 3D PRINTING**
TEACHING SCHEME	: TH:02; TU: 00;PR: 00(CLOCK HRs.)
TOTAL CREDITS	: 02 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 01 HR (Objective Type Online Examination)
PR. TEE EXAM	: -
PT. EXAM	: 20 Min (Objective Type)

❖ RATIONALE:

Additive manufacturing is a comparatively recent and advanced manufacturing technique that is becoming a key area of interest in every industrial field. Additive Manufacturing (AM) is the process of joining materials to create components from computer aided design (CAD) model data, and typically layer by layer, as opposed to subtractive manufacturing methods. Additive manufacturing is sometimes referred to as 3D printing, additive manufacturing, or freeform manufacturing. Additive manufacturing is a revolutionary unique method of producing components directly from the digital CAD model using a layer-by - layer material build-up technique. This tool-less manufacturing method can manufacture completely dense metal parts in less time, with high precision and accuracy. Advantages of additive manufacturing are, including the freedom of part design, part complexity, light weighting, part consolidation and function design, which generate specific interest in metal additive manufacturing for aerospace, oil & gas, marine and automotive applications and many more.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Identify the Different 3D printing Technology and machines used in Additive manufacturing.
2. Select suitable Machine and Material for printing.
3. Describe the CAD Modeling.

4. Different applications of Additive manufacturing.
5. Select the different equipments in Additive manufacturing.
6. Describe the concept of Post processing.

❖ **COURSE DETAILS:**

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. Introduction to Additive Manufacturing and 3D Printing Technology	1a. Describe given trends shaping the evaluation of 3D printing. 1b. Describe the Technology improvement. 1c. Classify the Additive Manufacturing Systems on given basis with advantages and disadvantages.	1.1 Development of Additive Manufacturing 1.1.1 Major trends shaping the evaluation of 3D printing 1.1.2 Technology Improvement Process 1.2 Classification of Additive Manufacturing Systems 1.2.1 Advantages and Limitations: 1.2.2 Additive V/S Conventional Manufacturing Processes.	05
2. CAD for Additive Manufacturing	2a. Prepare the given CAD Models. 2b. Describe the STL File Manipulation and given Additional Software to Assist AM. 2c. Describe the given Additive Manufacturing File Forma.	2.1 Introduction 2.1.1 Preparation of CAD Models: The STL File 2.1.2 Problems with STL Files 2.1.3 STL File Manipulation 2.2 Additional Software to Assist AM 2.3 The Additive Manufacturing File Format	05
3. Materials in Additive Manufacturing	3a. Describe the methods for Choosing Materials for Manufacturing. 3b. Describe the given Composite Materials. 3c. Describe the Ceramics & the given Materials.	3.1 Choosing Materials for Manufacturing 3.1.1 Multiple Materials 3.1.2 Metal AM Processes & Materials 3.2 Composite Materials 3.2.1 Biomaterials, Hierarchical Materials & Biomimetics. 3.2.2 Ceramics & Bio-ceramics 3.3 3 D Printing & Bio-Active Materials	06
4. Applications and Examples	4a. Describe the given Material Relationship. 4b. Describe the Applications in the given Engineering field. 4c. Describe the Applications in given Industry.	4.1 Application - Material Relationship 4.1.1 Applications in Design 4.2 Applications in Engineering, Analysis and Planning 4.3 Applications in Manufacturing	06

	4d. Describe the Applications in given Arts and Architecture.	and Tooling 4.4 Applications in Aerospace Industry 4.4.1 Applications in Automotive Industry 4.4.2 Applications in Jeweler Industry 4.4.3 Applications in Arts and Architecture	
5. Additive Manufacturing Equipment	5a. Describe the given Process Equipment Design and process parameters. 5b. Describe given Bonding Mechanism. 5c. List Common Faults and Troubleshooting. 5d. State the given Process design.	5.1 Process Equipment- Design and process parameters 5.2 Governing Bonding Mechanism 5.3 Common Faults and Troubleshooting. 5.4 Process design	05
6. Post Processing	6a. Describe the given Support 6b. Material Removal process. 6c. Describe the process of given Improvements. 6d. Describe Property Enhancements using the given Techniques.	6.1 Support Material Removal 6.2 Surface Texture Improvements 6.2.1 Accuracy Improvements 6.2.2 Aesthetic Improvements 6.3 Property Enhancements Using Non-thermal Techniques 6.3.1 Property Enhancements Using Thermal Techniques.	05
Total			32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Nil

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Introduction to Additive Manufacturing and 3D Printing Technology	02(00)	00(00)	02(00)	04(00)
2	CAD for Additive Manufacturing	01(00)	02(00)	03(01)	06(01)
3	Materials in Additive Manufacturing	02(00)	02(01)	02(00)	06(01)
4	Applications and Examples	00(01)	02(00)	02(00)	04(01)
5	Additive Manufacturing Equipment	00(00)	02(01)	02(00)	04(01)
6	Post Processing	02(00)	02(00)	02(01)	06(01)
	Total	07(01)	10(02)	13(02)	30(05)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

T-Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1R2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Options
Q 01 To Q 35	1	R	1	1	R	1	1	A	1	1	A	1	2	R	1	30/35
	2	U	1	2	U	1	2	A	1	2	A	1	2	A	1	
	2	A	1	3	R	1	3	R	1	3	U	1	3	U	1	
	3	U	1	3	A	1	3	A	1	4	R	1	4	U	1	
	4	U	1	4	A	1	4	A	1	5	U	1	5	U	1	
	5	U	1	5	A	1	5	A	1	6	R	1	6	R	1	
	6	U	1	6	U	1	6	A	1	6	A	1	6	A	1	

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	15	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assign-ments	05	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	30	12	Theory Answer Scripts	1,2,3,4,5,6
				Total	50	20		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	--	--	Journal	
		Journal Writing		Assign-ments	--	--	Journal	
				Total	--	--		
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	Practical Answer Scripts	
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

Nil

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	-	-	-	-	-	3	-	3
2	3	-	2	-	3	-	3	3	3
3	3	-	2	-	3	-	3	3	3
4	3	1	-	3	3	-	3	3	3
5	3	-	-	3	3	-	3	-	3
6	3	-	-	3	3	-	3	-	3

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N .	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Additive Manufacturing and 3D Printing Technology: Principles and Applications	Dr. G.K. Awari, Dr. D.P.Kothari, Prof. Vishwjeet Ambade, Dr. C. S. Thorat, CRC Press, Taylor & Francis Group	9780367436223
2	Additive Manufacturing Technologies 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing	Ian Gibson , David Rosen , Brent Stucker, Springer New York Heidelberg Dordrecht London	ISBN 978-1-4939-2112-6 ISBN 978-1-4939-2113-3 (eBook) DOI 10.1007/978-1-4939-2113-3
3	Additive Manufacturing Innovations, Advances, and Applications	T.S. Srivatsan , T.S. Sudarshan, CRC Press, Taylor & Francis Group	13: 978-1-4987-1478-5 (eBook - PDF)
4	Understanding Additive Manufacturing Rapid Prototyping · Rapid Tooling · Rapid Manufacturing	Andreas Gebhardt, Hanser Publishers, Munich Hanser Publications, Cincinnati	ISBN-13: 978-1-56990-507-4 (hardcover) ISBN-10:1-56990-507-X (hardcover)
5	Additive Manufacturing of Metals: The Technology, Materials, Design and Production	Li Yang •, Keng Hsu , Brian Baughman Donald Godfrey , Francisco Medina Mamballykalathil Menon Soeren Wiener, Springer Series in Advanced Manufacturing	ISBN 978-3-319-55127-2 ISBN 978-3-319-55128-9 (eBook) DOI 10.1007/978-3-319-55128-9

❖ **E-REFERECNES:**

- <https://www.youtube.com/watch?v=ICjQ0UzE2Ao>
- <https://www.youtube.com/watch?v=SfFIY0clCCA>
- <https://www.youtube.com/watch?v=PTcffCr19XY>
- <https://www.youtube.com/watch?v=5EMQdvfP7qs>
- <https://www.youtube.com/watch?v=o5sE2wn4qdw>
- https://www.youtube.com/watch?v=VyLHtaMDX_k

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr.G K Awari	Head of Automobile Engineering	Government Polytechnic, Nagpur.
2	Mr.S.D. Thakre	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
3	Dr.K.S.Dixit	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
4	Mr.S A Telang	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
5	Mr.R.B.Tirpude	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
6	Mr.Syed J.M.	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.

 (Member Secretary PBOS)

 (Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	:	DIPLOMA IN ME/CE/EE/PK/MT/TX/IT/CM/ MC/AI/EC/TR
COURSE CATEGORY:		OPEN ELECTIVE
COURSE CODE	:	OE210G
COURSE TITLE	:	RENEWABLE ENERGY SOURCES FOR MOBILITY**
TEACHING SCHEME:		TH: 02; TU: 00; PR: 00(CLOCK HRs.)
TOTAL CREDITS	:	02 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEEXAM	:	01 HRs (Objective Type Online Examination)
PR. TEEXAM	:	--
PT. EXAM	:	20 Min (Objective Type)

❖ RATIONALE:

World energy consumption steadily increases due to enhancement of quality of life, increase in transportation etc. Most of the energy demand can be fulfilled with the help of fossil fuels. Reservoirs of these fuels are limited. The aim of inclusion of this subject in the curriculum is to develop the ability in the student to develop the renewable energy sources so as to reduce the dependability on the nonrenewable power sources and improvements in engine performance and emission concern and their material compatibility concern. By using the renewable energy sources for vehicles can further reduce pollution and their overall carbon footprint by lowering greenhouse gas emissions from the vehicles.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Identify the renewable energy sources.
2. Select suitable bio-fuels for SI Engine vehicles.
3. Select suitable bio-fuels for CI Engine vehicles.
4. Analyze effect of blending of bio-fuels on performance and emission characteristics of the engines.

5. Compare the performance of Electric Vehicle with Conventional Engine driven vehicles.
6. Compare the performance of Fuel cells and solar operated vehicle with Conventional Engine driven vehicles.

❖ **COURSE DETAILS:**

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. Global Energy Review	1a. Compare global energy scenario with India on the basis of given points. 1b. Describe the given biomass conversion technologies. 1c. Describe the layout, applications, construction and working of given type of renewable energy sources.	1.1 Introduction to Energy Sources. Global Energy Sources and the Present Energy Situation. 1.2 Renewable Energy Sources, Biomass Energy and Biomass Conversion Technologies a. Layout, Applications, 1.3 Construction and working. • Hydropower • Geothermal Energy • Wind Energy • Solar Energy • Bio-hydrogen	05
2. Alternative Fuels for SI Engines	2a. Describe the Properties and modifications required in SI Engines to use given type of alternate Bio-Fuels (Alcohol Fuels). 2b. Describe the effect on Engine performance and emission Characteristics in SI Engines to use given type of alternate Biofuels (Gaseous Fuels).	2.1 Properties, Material Compatibility, effect on Engine performance and Emission Characteristics and Modifications required in SI Engines to use alternate Bio-Fuels (Alcohol Fuels): • Methanol • Ethanol • Propane • Butanol • Dimethyl Carbonate 2.2 Properties, Material Compatibility, effect on Engine performance and emission Characteristics and modifications required in SI Engines to use alternate Biofuels(Gaseous Fuels): • Producer Gas • Biogas • Bio-Syngas • Hydrogen	07

3. Alternative Fuels for a CI Engines	3a. Describe the Properties and modifications required in CI Engines to use given type of alternate Bio-Fuels. 3b. Describe effect of blending of the given type of bio- fuels on emission and performance of the CI Engines.	3.1 Properties, Material Compatibility, effect on engine performance and emission Characteristics and modifications required in CI Engines to use alternate Biofuels: Biodiesel Fischer–Tropsch Diesel Dimethyl Ether DiEthyl Ether 3.2 Blending of Bio-fuels and its effect on engine performance and emissions.	05
4. Bi-Fuel Vehicles	4a. Describe the given type of Bi-fuel vehicle layout, construction and working. 4b. Compare Bi-Fuelled Vehicles with Non-renewable Energy fuel Vehicles on the basis of given parameters. 4c. Draw the layout and describe the construction and working of given dual fuel vehicles. 4d. Compare Dual-Fuelled Vehicles with conventional Vehicles on the basis of given parameters.	4.1 Bi-Fuel Vehicles: Layout construction and working. 4.2 Comparison of Bi-Fuelled Vehicles with Non-renewable Energy fuel Vehicles and Conventional Vehicles. 4.3 Dual-Fuel Vehicles: Layout construction and working. 4.4 Comparison of Dual-Fuelled Vehicles with Non-renewable Energy fuel Vehicles and Conventional Vehicles.	05
5. Electrical and Hybrid Vehicles	5a. Draw the layout of given type of Electrical Vehicles and describe its construction and working. 5b. Compare the Hybrid vehicle with Conventional vehicles on the basis of given parameters.	5.1 Electric Vehicles: Layout, Components, construction, working advantages and disadvantages. 5.2 Hybrid Vehicle: Layout, Components, construction, working advantages and disadvantages.	05
6. Fuel Cell and Solar Operated Vehicles	6a. Compare fuel cell operated vehicle with conventional vehicle on the basis of given parameters. 6b. Draw a layout of given type of solar operated vehicles and describe its working principle. 6c. Justify the modifications required in conventional engine vehicle to implement the given type of renewable	6.1 Fuel Cell Vehicles: Types of Fuel Cells, Layout, Components, Working Principle of Fuel Cells, advantages and disadvantages. 6.2 Solar Operated Vehicles: Layout, Components, Working Principle of solar Vehicles, advantages and disadvantages.	05

	energy sources.	6.3 Modifications required in conventional vehicles to implement Fuel cell and solar renewable energy sources.	
Total			32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Nil

❖ **SPECIFICATION TABLE FOR THEORY PAPER:**

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Global Energy Review	02(00)	00(00)	00(00)	02(00)
2	Alternative Fuels for a SI Engines	01(00)	02(00)	05(01)	08(01)
3	Alternative Fuels for a CI Engines	01(00)	01(01)	02(00)	04(01)
4	Bi-Fuel Vehicles	00(01)	02(00)	02(00)	04(01)
5	Electrical and hybrid vehicles	00(00)	02(01)	02(00)	04(01)
6	Fuel Cell and Solar operated vehicles	03(00)	03(00)	02(01)	08(01)
	Total	07(01)	10(02)	13(02)	30(05)

R – Remember

U – Understand

A – Analyze / Apply

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:**

T-Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember,

Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Options
Q 01 To Q 35	1	R	1	1	R	1	2	R	1	2	U	1	2	U	1	30/35
	2	A	1	2	A	1	2	A	1	2	A	1	2	A	1	
	2	A	1	3	R	1	3	U	1	3	U	1	3	A	1	
	3	A	1	4	R	1	4	U	1	4	U	1	4	A	1	
	4	A	1	5	U	1	5	U	1	5	U	1	5	A	1	
	5	A	1	6	R	1	6	R	1	6	U	1	6	U	1	
	6	U	1	6	R	1	6	A	1	6	A	1	6	A	1	

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	15	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assign-ments	05	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	30	12	Theory Answer Scripts	1,2,3,4,5,6
				Total	50	20		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	--	--	Journal	
		Journal Writing		Assign-ments	--	--	Journal	
				Total	--	--		
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	Practical Answer Scripts	
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

Nil

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	-	-	-	-	-	3	-	3
2	3	-	2	-	3	-	3	3	3
3	3	-	2	-	3	-	3	3	3
4	3	1	-	3	3	-	3	3	3
5	3	-	-	3	3	-	3	-	3
6	3	-	-	3	3	-	3	-	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Alternative Fuels Guide book Properties, Storage, Dispensing, and Vehicle Facility Modifications	Richard L. Bechtold, RE, Society of Automotive Engineers, Inc. Warrendale, 1 st Edition, 2000	0-7680-0052-1
2	Biofuels and Bioenergy Processes and Technologies	Sunggyu Lee and Y. T. Shah, CRC Press Taylor & Francis Group, 1 st Edition, 2013	13: 978-1-4200-8956-1
3	Electric and Plug-In Hybrid Vehicles Advanced Simulation Methodologies	Bogdan Ovidiu Varga, Florin Mariasiu, Dan Moldovanu, Calin Iclodean, Springer-Verlag London Limited, 2015	978-3-319-18639-9
4	Alternative fuels and advanced vehicle technologies for improved Environmental performance Towards zero carbon transportation	Richard Folkson, Woodhead Publishing (Elsevier), 2 nd Edition, 2013	978-0-85709-742-2
5	Alternative Fuels for Transportation	Arumugam S. Ramadhas, CRC Press Taylor & Francis Group, 2013	13: 978-1-4398-1958-6
6	Alternative Transportation Fuels Utilization in Combustion Engines	York M. K. Gajendra Babu, K. A. Subramanian, CRC Press Taylor & Francis Group, 1 st Edition, 2013	13: 978-1-4398-7282-6
7	Biodiesel A Realistic Fuel Alternative for Diesel Engines	Ayhan Demirbas, Springer-Verlag London Limited, 2008	13: 9781846289941

8	Handbook of Alternative Fuel Technologies	Sunggyu Lee James G. Speight Sudarshan K. Loyalka, CRC PressTaylor & Francis Group 2013	13: 978-0-8247-4069-6
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❖ **E-REFERECNES:**

- https://www.youtube.com/watch?v=mh51mAUexK4&list=PLwdnzlV3ogoXUifhvYB65lLJCZ74o_fAk dated 16th February 2022.
- https://www.youtube.com/watch?v=rK6Bey_loiw&list=PLdzIIxVTz4AsglVyHhZJ6Jj7tnpa3NL0n dated 16th February 2022.
- <https://www.youtube.com/watch?v=F2sZgWgvTAg> dated 16th February 2022.
- https://www.youtube.com/watch?v=wsz-LEFuLdc&list=PLLy_2iUCG87A7TdFpl6_xdgo-aYskxjXb dated 16th February 2022.
- <https://www.youtube.com/watch?v=L2VSOccUrSk> dated 16th February 2022.
- https://www.youtube.com/watch?v=QLN_6jPJgv0 dated 16th February 2022.
- <https://www.youtube.com/watch?v=LsWHqyjaD00> dated 16th February 2022.

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

NIL

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr.G.K.Awari	Head of Automobile Engineering	Government Polytechnic, Nagpur.
2	Mr.S.D.Thakre	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
3	Dr.K.S.Dixit	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
4	Mr.S.A.Telang	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
5	Dr.R.B.Tirpude	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
6	Mr.Syed J.M.	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : DIPLOMA IN AE/ME/CE/EE/PK/TX/IT/CM/MC/AI/EC/TR
COURSE CATEGORY: OPEN ELECTIVE COURSES
COURSE CODE : OE211G
COURSE TITLE : SELECTION OF MATERIALS**
TEACHING SCHEME: TH:02; TU:00;PR:00(CLOCK HRs.)
TOTAL CREDITS : 02 (1 TH/TU CREDIT=1 CLOCK HR.,1 PR CREDIT = 2 CLOCK HRs.)
TH. TEE : 01 HR (Objective Type Online Examination)
PR. TEE : --
PT. : 20 Min (Objective Type)

❖ RATIONALE:

Introducing a new engineering product or changing an existing model involves making designs, reaching economic decisions, selecting materials, choosing manufacturing processes, and assessing its environmental impact. These activities are interdependent. and materials and processes used in making the product can have a large influence on its design, cost, and performance in service. . Industries now emphasis on manufacturing products and goods locally, & how products affect the environment, and society. The aim of the subject is to enable judicious selection of material based upon the relationship between technical and economic facts.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Utilize different Material selection charts for various applications.
2. Interpret factors for selection process of different materials
3. Select materials for industrial applications depending on their properties
4. Select suitable biomaterials and magnetic materials for different applications.

❖ **COURSE DETAILS:****A.THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs
1. Introduction	1a. State Principles involved in the selection of materials. 1b. Illustrate Selection criteria for required materials. 1c. Identify different material properties. 1d. Employ Material selection charts for various applications. 1e. Illustrate Factors affecting material prices, material substitution. 1f. Relate Strength vs. density & Young's modulus vs. density selection charts. 1g. Select material for various applications depending on the properties.	1.1 Principles involved in the selection of materials 1.2 Selection Criteria : Availability, Economics, Properties 1.3 Selection process, determination of performance requirements, Evaluation of alternatives 1.4 Material Properties: Chemical, Physical and Mechanical, properties in detail and limits on properties 1.5 Factors affecting material prices, material substitution 1.6 Material selection charts 1.7 Strength vs. density 1.8 Young's modulus vs. Density.	08
2. Functional Requirement of Engineering Materials	2a. State functional requirement of engineering materials. 2b. Select proper material required for different applications. 2c. Illustrate selection of materials for toughness. 2d. Assess toughness of different materials with suitable examples. 2e. Describe Creep Curve. 2f. Describe effect of stress and temperature on Creep. 2g. Select suitable non ferrous materials for given application. 2h. Draw Creep curve.	2.1 Selection of material for strength, resistance to corrosion – temperature -wears with practical examples 2.2 Materials selection for stiffness : Stiffness of engineering materials, Importance of stiffness, material selection criterion for stiffness with examples 2.3 Materials selection for toughness Toughness, Selection of materials for toughness, assessment of toughness of different materials with examples 2.4 Material selection for fatigue strength: Mechanisms, evaluation of fatigue life of different materials. 2.5 Material selection for creep : Mechanism, evaluation of creep resistance, Creep curve, Effect of	08

	2i. Recommend corrosion resistant materials for a given application .	stress and temperature, development of creep resistant alloys, selection criterion. 2.6 Selection of non ferrous materials.	
3. Selection of Materials for Different Applications	3a. Describe Tool steel & corrosion resistant steels. 3b. Identify properties required for materials for different applications. 3c. Define weldability, formability, and forgeability. 3d. Select proper materials for tools and components for various industrial applications. 3e. Select tool materials for various ore-dressing equipments. 3f. Recommend materials for various industrial and metallurgical applications.	3.1 High strength, heat resistant alloys, corrosion resistant steels required for good weldability, formability, forgeability, 3.2 Tool steels required for cutting, cold-working dies, hot working dies 3.3 Selection of materials and processes for tools and components of : a) automobile engines b) machine tools, c) foundry d) metal-working equipment, e) Testing machine,, f) ore-dressing equipment.	08
4. Magnetic Materials & Biomaterials	4a. Describe different properties of Magnetic materials. 4b. List various biomaterials. 4c. Compare different Biomaterials. 4d. State properties of Biomaterials. 4e. State applications of 4f. Magnetic materials . 4g. Select different Bio materials in various applications. 4h. Select Magnetic material for given application.	4.1 Introduction to magnetic materials 4.2 Types of Magnetic materials 4.3 Concept of Diamagnetism, paramagnetism and Ferromagnetism 4.4 Applications of Magnetic materials 4.5 Introduction to Biomaterials 4.6 Concept of Biocompatibility 4.7 Classification and applications of biomaterials	08
Total Hrs.			32

❖ **SPECIFICATION TABLE FOR THEORY PAPER:**

R – Remember

U – Understand

A – Analyze / Apply

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Introduction	01(00)	03(00)	04(00)	08(00)
2	Functional requirement of engineering materials	02(00)	02(00)	04(01)	08(01)
3	Selection of materials for different applications	02(00)	02(02)	04(02)	08(04)
4	Introduction to magnetic materials & Biomaterials	01(00)	02(00)	03(00)	06(00)
	Total	06(00)	09(02)	15(03)	30(05)

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:**

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Options
Q 01 To Q 35	1	R	1	1	R	1	1	U	1	1	U	1	2	R	1	30/35
	2	U	1	2	U	1	2	A	1	2	A	1	2	A	1	
	3	R	1	3	U	1	3	A	1	3	A	1	3	A	1	
	3	A	1	3	A	1	4	R	1	4	U	1	4	U	1	
	4	A	1	4	A	1	4	A	1	5	A	1	5	A	1	
	5	U	1	5	U	1	5	U	1	5	A	1	5	A	1	
	6	R	1	6	U	1	6	A	1	6	A	1	6	A	1	

T- Unit/Topic Number
R-RememberL- Level of Question
U-UnderstandM- Marks
A-Analyze/ Apply

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	15	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assign-ments	05	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	30	12	Theory Answer Scripts	1,2,3,4,5,6
				Total	50	20		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	--	--	Journal	
		Journal Writing		Assign-ments	--	--	Journal	
				Total	--	--		
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	Practical Answer Scripts	
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION: Nil**❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							PSO	PSO	PSO
	1	2	3	4	5	6	7	1	2	3
1	3	3	3	3	3		3			
2	3	3	3	3	3		3			
3	3		3	3	3		3			
4	3	4	3	3	3	3	3			

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Materials Selection in Mechanical Design	Mike Ashby, Butterworth-Heinemann, New Edition, 2011	9781856176637
2	Engineering Materials – Properties and Selection	Kenneth G. Budinski, Prentice-Hall of India, 1998	13:9780139047152
3	Materials and Process Selection for Engineering Design,	Mahmoud M. Farag Third Edition CRC Press, 2013	1466564091, 9781466564091
4	Mechanical Metallurgy	George E. Dieter, McGraw-Hill Education; 3 rd Edition, 1986	978-0070168930

❖ **E-REFERENCES:**

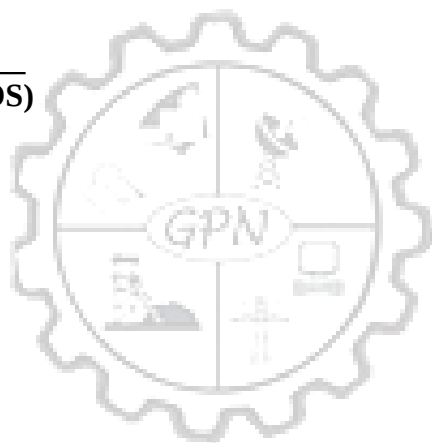
- <http://www.nptel.ac.in/courses/112104122/> , accessed on 14th July, 2021
- <https://www.youtube.com/watch?v=85HxmnLEkwM> , accessed on 14th July, 2021
- <https://www.youtube.com/watch?v=vnFN1oVJNY>, accessed on 14th July, 2021
- <https://www.youtube.com/watch?v=P-tg52VRzZU> , accessed on 14th July, 2021

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION: Nil**

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Shri.K.L.Meshram	HOD Metallurgical Engineering	Government Polytechnic, Nagpur.
2	Miss.V.C.Humney	Lecturer Metallurgical Engineering	Government Polytechnic, Nagpur.
3	Prof.YY.Mahajan	Assist. Professor , Metallurgy & Material Science	VNIT Nagpur
4	Shri.S.B.Varadpande	Managing Director	Orange city alloys Pvt. Ltd Nagpur
5	Shri.Y.K.Gaiky	Lecturer Mechanical Engineering	Government Polytechnic, Sakoli

(Member Secretary PBOS)



(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : DIPLOMA IN ME/CE/EE/PK/TX/IT/CM/MC/AI/EC/TR/AE
COURSE CATEGORY: OPEN ELECTIVE COURSES
COURSE CODE : OE212G
COURSE TITLE : NON DESTRUCTIVE TESTING
TEACHING SCHEME: TH:02; TU:00;PR:00(CLOCK HRs.)
TOTAL CREDITS : 02(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE : 01 HR (Objective Type Online Examination)
PR. TEE : -
PT. : 20 Min (Objective Type)

❖ RATIONALE:

Metallurgical engineering is a discipline that mainly deals with various metallic materials on the earth for the benefit of mankind. For that it is required to assess soundness of metallic materials during various stages of their formation. non Destructive Testing is essential to control and correlate various manufacturing parameters and also to decide suitability and predict probable behavior of metallic materials in practice. With the knowledge of non destructive testing procedures, students conduct various tests like ultrasonic, dye penetrant , magnetic tests, etc. and comment on soundness of materials

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Compare various NDTs .
2. Make use of DP and visual examination for crack detection.
3. Inspect metal products for defects using ultrasonic test.
4. Prepare sample for different NDT's to be carried out.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs
1. Scope of Testing	1a. State the need for NDT 1b. Discuss Different types of Types of non-destructive test. 1c. Select suitable NDT for proper application. 1d. Classify NDT methods.	1.1 Concept of non destructive testing Need of Non- destructive test 1.2 Introduction to NDT 1.3 Types of non-destructive test 1.4 Comparison of NDT with Destructive testing	05
2. Visual Examination, Dye Penetrant Tests	2a. State the need for visual Testing method. 2b. Select dye penetrant tests for crack detection. 2c. Enlist various types of developers used in DPT. 2d. Conduct DPT methods. 2e. Prepare Sample for conducting DPT. 2f. Select suitable developer for DPT.	2.1 Methods of Examination for defects: Visual examination, Hammer tests etc. 2.2 Penetrant tests, 2.3 Visual Optical methods, Dyepenetrant testing, Basic principle, Types of dye and methods of application, Developer application and Inspection.	09
3. Ultrasonic Testing	3a. Describe Ultrasonic testing in brief . 3b. Enlist types of transducers 3c. Discuss various probes used in UT. 3d. Conduct ultrasonic testing on metals. 3e. Prepare Sample for conducting UT.	3.1 Ultrasonic Testing: Fundamentals, Equipments, procedure and applications. Interpretation of results. 3.2 Ultrasonic testing: Basics of ultrasonic waves, Pulse and beam shapes, Ultrasonic transducers	09
4. Magnetic Particle Method	4a. Describe Magnetic analysis method of testing. 4b. Discuss yoke type magnetic particle testing.	4.1 Method based on magnetic analysis, yoke type , probe type magnetic crack detector 4.2 Magnetic particle testing, Basic theory of magnetism, Magnetization methods, Field indicators, Particle application, Inspection.	09

	4c. Discuss Various Magnetization methods. 4d. Conduct MPT methods. 4e. Prepare Sample for conducting MPT.		
Total Hrs.			32

❖ **SPECIFICATION TABLE FOR THEORY PAPER:**

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Scope Of Testing	01(00)	02(00)	03(01)	06(01)
2	Visual examination , Dye Penetrant tests	02(00)	02(00)	04(00)	08(00)
3	Ultrasonic Testing	02(00)	02(02)	04(01)	08(03)
4	Magnetic particle method	01(00)	03(00)	04(01)	08(01)
	Total	06(00)	09(02)	15(03)	30(05)

R – Remember

U – Understand

A – Analyze / Apply

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:**T-Unit/Topic Number
R-RememberL- Level of Question
U-UnderstandM- Marks
A-Analyze/ Apply

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Options
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
Q 01 To Q 35	1	R	1	1	R	1	1	U	1	1	U	1	1	R	1	30/35
	1	U	1	2	U	1	2	A	1	2	A	1	2	U	1	
	2	R	1	2	U	1	2	A	1	2	U	1	2	U	1	
	2	U	1	3	R	1	3	R	1	3	U	1	3	U	1	
	3	U	1	3	A	1	3	A	1	3	U	1	3	A	1	
	3	U	1	4	U	1	4	U	1	4	R	1	4	R	1	
	4	R	1	4	U	1	4	A	1	4	A	1	4	A	1	

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	15	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assign-ments	05	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	30	12	Theory Answer Scripts	1,2,3,4,5,6
				Total	50	20		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	--	--	Journal	
		Journal Writing		Assign-ments	--	--	Journal	
				Total	--	--		
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	Practical Answer Scripts	
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION: Nil**

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							PSO	PSO	PSO
	1	2	3	4	5	6	7	1	2	3
1	3			3	3	3	3	3		
2	3		3	3	3	3	3	3		
3	3	3		3	3	3	3	3		
4	3	3	3	3	3	3	3	3		

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Testing of materials	Prof. A.V.K. Suryanarayana. BS Publications/BSP Books , 2nd Edition, 2013	13 : 978-81-7800-134-0
2	The Testing of Engineering materials,	H. E. Davis, G. E. Troxell , Mcgraw Hill Publishing Company, Fourth Edition,1982	81-7409-026-6
3	Mechanical Metallurgy	George Dieter, Mc Graw Hill, Third edition , March 2013	0-07-084453-4
4	Nondestructive Testing, Nondestructive Evaluation and Quality Control,	Louis Cartz, ASM International ASM Handbook, Vol. 17.	

❖ **E-REFERENCES:**

- <http://www.nptel.ac.in/courses/112106141/https://www.youtube.com/> accessed on 11th August, 2021
- <https://www.youtube.com/watch?v=D8U4G5kcpcM> , accessed on 11th August, 2020
- <https://www.youtube.com/watch?v=EeiwCbtJWyI> , accessed on 11th August, 2021
- <https://www.youtube.com/watch?v=dGT233GsqHE> , accessed on 11th August, 2021
- <https://www.nde-ed.org> , accessed on 04/01/2022
- <https://documents.pub/document/appreciation-to-ndt-31ppt.html>, accessed on 04th Jan 2022

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

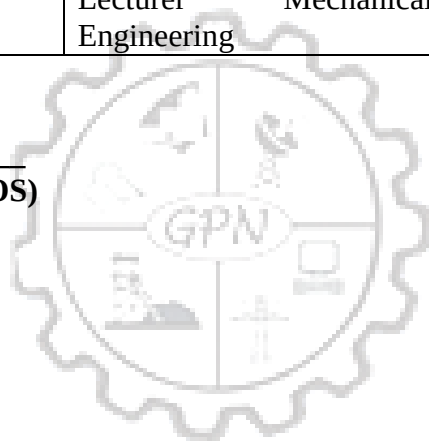
Nil.

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Mr.K.L.Meshram	HOD Metallurgical Engineering	Government Polytechnic, Nagpur.
2	Miss.V.C. Humney	Lecturer Metallurgical Engineering	Government Polytechnic, Nagpur.
3	Mr.S.M.Waikar	Lecturer Metallurgical Engineering	Government Polytechnic, Nagpur
4	Mr.Y.Y.Mahajan	Assist. Professor , Metallurgy & Material Science	VNIT Nagpur
5	Mr.S.B.Varadpande	Managing director	Orange city alloys Pvt. Ltd Nagpur
6	Mr.Y.K.Gaiky	Lecturer Mechanical Engineering	Government Polytechnic, Sakoli

(Member Secretary PBOS)

(Chairman PBOS)



GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN AE/AI/CE/CM/EC/IT/MC/ME/ MT/PK/TX/TR
COURSE CATEGORY	: OPEN ELECTIVE COURSE
COURSE CODE	: OE215G
COURSE TITLE	: RENEWABLE ENERGY TECHNOLOGIES **
TEACHING SCHEME	: TH:02; TU: 00;PR: 00(CLOCK HRs.)
TOTAL CREDITS	: 02 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 01 HR (Objective Type Online Examination)
PR. TEE EXAM	: -
PT. EXAM	:20 Min (Objective Type)

❖ RATIONALE:

Renewable energy is crucial in improving climate on earth. Renewable technologies will also yield a pollution-free environment. All the world is now focusing on the generation of energy through renewable sources. This course is designed for diploma students to explore possibility of harnessing electrical energy from renewable sources such as Solar Thermal, Solar Photovoltaic, Wind, Biomass, other renewable sources.

❖ COURSE OUTCOMES:

After completing this course students will be able to—

1. Predict potential of renewable energy sources.
2. Apply various methods of solar energy harvesting.
3. Identify different parts of Wind power Plant.
4. Describe process of generation of electrical energy from Bio-Mass.
5. Compare Hydrogen Energy and Fuel cell with other sources of energy.
6. Describe principle of energy generation using different Renewable Energy Sources.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs
1. Introduction	1a. Estimate reserve of given conventional sources of energy. 1b. Describe effects of usage of given conventional energy sources on environment. 1c. Predict potential of given renewable energy in world and India.	1.1 World Energy Use; Reserves of Energy Resources like coal, petroleum 1.2 Environmental Aspects of Conventional Energy Utilization 1.3 Renewable Energy Scenario in India and around the World, Potentials of Renewable Energy in world and India	04
2. Solar Energy	2a. Describe given terms related to Solar Radiation. 2b. Compare flat plate collectors and evacuated type collectors on given factors. 2c. Identify given type of solar panel . 2d. Justify need of Stand alone PV System.	2.1 Solar Radiation related terms and their meaning. 2.2 Working of Solar Water Heating System and types -Flat Plate and Evacuated Type 2.3 Definition of PV Cell ,Module, Array, Panel 2.4 Stand alone Solar PV System-Block Diagram and working	06
3. Wind Energy	3a. Compare types of Wind Turbine on given points. 3b. Identify given parts of a Wind Turbine. 3c. Select site for given type of Wind Turbine.	3.1 Wind Turbine -HAWT and VAWT 3.2 Working of Wind Power Plant 3.3 Site Selection for Wind Power Plant	06
4. Bio Energy	4a. Identify type of given biomass. 4b. Describe given terms related to gasifier. 4c. Identify given part of KVIC Biogas Plant. 4d. Select materials used in Ethanol production. 4e. Apply various steps in preparation of	4.1 Biomass and its types 4.2 Biomass Gasifier Definition and meaning of Dehydration, Pyrolysis, Combustion, Gasification 4.3 Working of KVIC Biogas Plants 4.4 Ethanol Production Method 4.5 Bio Diesel Production Method- Transesterification Method	04

	Biodiesel using given material.		
5. Hydrogen Energy and Fuel Cells	5a. Compare Hydrogen Fuel with given conventional energy source. 5b. Describe working of given components in Fuel Cells. 5c. Compare given types of Fuel Cells .	5.1 Hydrogen Energy -Advantages and Applications 5.2 Working of H ₂ O ₂ fuel cell 5.3 Compare types of Fuel Cell- PEM,AFC,PAFC,MCFC,SOFC,DM FC on operating temperature , power, efficiency , applications	06
6. Other Renewable Energy Sources	6a. Describe working of given Tidal Power Plant. 6b. Describe how electric power is generated from waves . 6c. Identify given type of Hydro Power Plant. 6d. Organize components of Micro Hydro Power Plant in a correct sequence.	6.1 Tidal Power Plant Block Diagram and Working 6.2 Energy Generation from waves – Block Diagram and Working 6.3 Block Diagram and Working of Hydropower Generation Types depending on rating -Large, Medium, Small, Mini, Micro on rating 6.4 Micro Hydro Power Project Layout and working	06
		Total Hrs	32

B. LIST OF PRACTICALS / LABORATORY EXPERIENCES / ASSIGNMENTS:

Nil

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Introduction	02(00)	00(00)	00(00)	02(00)
2	Solar Energy	01(00)	02(00)	05(01)	08(01)
3	Wind Energy	01(00)	01(01)	02(00)	04(01)
4	Bio Energy	00(01)	02(00)	02(00)	04(01)
5	Hydrogen Energy and Fuel Cells	00(00)	02(01)	02(00)	04(01)
6	Other Renewable Energy Sources	03(00)	03(00)	02(01)	08(01)
	Total	07(01)	10(02)	13(02)	30(05)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

T- Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Options
Q 01 To Q 35	1	R	1	1	R	1	2	R	1	2	U	1	2	U	1	30/35
	2	A	1	2	A	1	2	A	1	2	A	1	2	A	1	
	2	A	1	3	R	1	3	U	1	3	U	1	3	A	1	
	3	A	1	4	R	1	4	U	1	4	U	1	4	A	1	
	4	A	1	5	U	1	5	U	1	5	U	1	5	A	1	
	5	A	1	6	R	1	6	R	1	6	U	1	6	U	1	
	6	U	1	6	R	1	6	A	1	6	A	1	6	A	1	

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	15	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assign-ments	05	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	30	12	Theory Answer Scripts	1,2,3,4,5,6
				Total	50	20		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	--	--	Journal	
		Journal Writing		Assign-ments	--	--	Journal	
				Total	--	--		
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	Practical Answer Scripts	
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

Nil

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							PSO	PSO	PSO
	1	2	3	4	5	6	7	1	2	3
1	3				3		3			
2	3				3	1	3			
3	3				3		3			
4	3				3		3			
5	3				3		3			
6	3				3		3			

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Renewable Energy Technologies- A Practical guide for beginners	Chetan Singh Solanki, PHI Learning Pvt. Ltd., First, 2008.	978-81-203-3434-2
2	Solar Energy: Principles of Thermal Collection and Storage	S.P. Sukhatme, McGraw-Hill Education (India), 3rd Edition, 2009	10: 0070142963 13: 978-0070142961
3	Solar Photovoltaic: Fundamentals, Technologies & Application	Chetan Singh Solanki, PHI Learning Pvt. Ltd., 3rd Edition, 2015	8120351118, 978-81-203-5111-0
4	Wind Power Plants and Project Development	Joshua Earnest , Tore Wizelius, PHI Learning Pvt. Ltd., 2nd Edition, 2015	978-81-203-5127-1
5	Renewable Energy Sources and Emerging Technologies	D.P.Kothari, K.C.Singal, Rakesh Ranjan, PHI Learning Pvt. Ltd., 2nd Edition, 2015	978-81-203-4470-9
6	Solar Photovoltaic Technology and System: A Manual for Technicians, Trainers and Engineers	Chetan Singh Solanki, PHI Learning Pvt. Ltd., 5th Edition, 2016	978-81-203-4711-3

❖ **E-REFERENCES:**

- https://www.youtube.com/watch?v=Giek094C_l4&ab_channel=SmileandLearn-English, accessed on 6th November, 2021
- https://www.youtube.com/watch?v=4vPyA_wDM5c&ab_channel=A1ADVENTURE accessed on 6th November, 2021
- https://www.youtube.com/watch?v=3UafRz3QeO8&ab_channel=BioConstruct accessed on 6th November, 2021
- https://www.youtube.com/watch?v=qSWm_nprfqE&ab_channel=Lesics , accessed on 6th November, 2021
- https://www.youtube.com/watch?v=0oK_VQnPDuY&ab_channel=DeepakumarYadav , accessed on 6th November, 2021
- https://www.youtube.com/watch?v=iPheEg-K2qc&ab_channel=RealEngineering accessed on 6th November, 2021

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

Nil

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Mr.A.M.Arekar	HoD, Electrical Engg.Deptt.	Government Polytechnic, Nagpur.
2	Dr.G.V.Gotmare	HoD, Electrical Engg. Deptt.	Government Polytechnic, Gondia
3	Mr.M.N.Gawande	Lecturer in Electrical Engg.	Government Polytechnic, Nagpur
4	Smt.A.A.Alegaonkar	Lecturer in Electrical Engg.	Government Polytechnic, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN AE/AI/CE/CM/EC/IT/MC/ME/ MT/PK/TX/TR
COURSE CATEGORY	: OPEN ELECTIVE COURSE
COURSE CODE	: OE216G
COURSE TITLE	: ENERGY CONSERVATION OPPORTUNITIES**
TEACHING SCHEME	: TH:02; TU: 00; PR: 00(CLOCK Hrs.)
TOTAL CREDITS	: 02 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 01 HR (Objective Type Online Examination)
PR. TEE EXAM	: --
PT. EXAM	: 20 Min (Objective Type)

❖ **RATIONALE:**

Energy conservation is a scientific and basic tool to make balance in different forms of energies. This course imparts the awareness, knowledge and practical skills/ techniques of energy conservation in various sectors. To maintain the growth of development, electricity generation will be required to be increased by proper utilization of renewable and non-renewable sources of energy. After completion of this course diploma engineering students must use various techniques and methods of energy conservation. Also they should be able to perform energy audit and its implementation.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Identify role of different Government Bodies in energy conservation.
2. Suggest measures for energy conservation after energy audit.
3. Propose measures to conserve energy in mechanical systems.
4. Apply measures to conserve energy in electrical systems.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs
1. Introduction	1a. Estimate energy requirement in world and India per year. 1b. Justify need of Energy Conservation Act 2003. 1c. Identify role of given government bodies in energy conservation. 1d. Identify stars on given appliance. 1e. Identify type of given building as per ECBC.	1.1 Energy scenario: Energy Demand and Supply in world and India 1.2 Energy Conservation Act 2003 1.3 Roles of MNRE, MEDA, BEE 1.4 Star Labelling-Meaning, Purpose 1.5 Energy Conservation Building Codes-Purpose, Building Classification	06
2. Energy Audit	2a. Select suitable measuring instrument for given application. 2b. Calculate Pay Back Period for given system. 2c. Describe various steps in Energy Audit.	2.1 Energy audit , Energy audit instruments and their use, Questionnaire for energy audit projects, Energy flow diagram 2.2 Simple payback period meaning and simple calculation 2.3 Energy Audit procedure -walk through audit and detailed audit.	06
3. Energy Conservation in Mechanical Systems	3a. Summarize different factors on which performance of given pump depends. 3b. Assess opportunities for saving energy in given mechanical systems. 3c. Implement measures for saving energy in fans and blowers. 3d. Describe effect of different parameters on efficiency of given compressor.	3.1 Factors affecting pump performance, Efficient Pumping system operation, Energy conservation opportunities in Pumping systems 3.2 Fan types, flow control strategies, Fan performance Assessment, Energy ,Conservation opportunities in Pumping systems 3.3 Measures for energy saving in fans and blowers 3.4 Classification of Compressors, Pneumatic System components, Effect of various parameters on efficiency of Compressor	08
4. Energy Conservation in Electrical Systems	4a. Suggest different measures for conserving energy in given electrical appliances. 4b. Select suitable energy	4.1 Measures for Energy conservation in -Refrigerators -Air conditioners -Electric Furnace -TV, Computers -Geysers	12

	conservation in technique in given condition for a lighting system. 4c. Justify need of energy conservation in given transformers and induction motors. 4d. Describe advantages of Cogeneration on given points. 4e. Describe how energy can be conserved by using given tariff system.	4.2 Energy Conservation in Lighting by -Replacing Lamp sources -Using energy efficient luminaries -Using light-controlled gears -Installation of separate transformer / servo stabilizer for lighting -Periodic survey and adequate maintenance programs 4.3 Need for energy conservation in induction motor and transformer 4.4 Cogeneration-Meaning, Advantages 4.5 Tariffs for energy conservation	
		Total Hrs	32

B. LIST OF PRACTICALS / LABORATORY EXPERIENCES / ASSIGNMENTS:

Nil

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Introduction	01(00)	01(00)	01(01)	03(01)
2	Energy Audit	01(00)	03(00)	03(01)	07(01)
3	Energy Conservation in Mechanical Systems	01(00)	03(00)	04(01)	08(01)
4	Energy Conservation in Electrical Systems	02(00)	04(01)	06(01)	12(02)
	Total	05(00)	11(01)	14(04)	30(05)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

T- Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Options
Q 01 To Q 35	1	R	1	1	U	1	1	A	1	1	A	1	2	R	1	30/35
	2	U	1	2	U	1	2	U	1	2	A	1	2	A	1	
	2	A	1	2	A	1	3	R	1	3	U	1	3	U	1	
	3	U	1	3	A	1	3	A	1	3	A	1	3	A	1	
	3	A	1	4	R	1	4	R	1	4	U	1	4	U	1	
	4	U	1	4	U	1	4	U	1	4	A	1	4	A	1	
	4	A	1	4	A	1	4	A	1	4	A	1	4	A	1	

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	15	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assign-ments	05	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	30	12	Theory Answer Scripts	1,2,3,4,5,6
				Total	50	20		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	--	--	Journal	
		Journal Writing		Assign-ments	--	--	Journal	
				Total	--	--		
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	Practical Answer Scripts	
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

Nil

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							PSO	PSO	PSO
	1	2	3	4	5	6	7	1	2	3
1	3				3		3			
2	3	3			3	2	3			
3	3	3			3		3			
4	3	3		3	3		3			

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Generation and Utilisation of Electrical Energy	D. Srilatha S. Sivnagraju M. Balasubbareddy, Pearson, New Delhi 2010	8131798771, 9788131798775 978-81-317-6774-O
2	India – The Energy Sector	P.D. Henderson, World Bank Publication, Oxford University Press, 1975.	0-19-521598-2-
3	Energy Management Handbook	W.C Turner, John Wiley and Sons Wiley Press Eighth Edition, 2015	10: 142008870X
4	Efficient Use and Management of Electricity in Industry.	B.G. Desai, J.S. Rana, A.V. Dinesh, R. Paraman, Devki Energy Consultancy Pvt. Ltd, 4th Edition, 2016	-

❖ **E-REFERENCES:**

- <https://legislative.gov.in/sites/default/files/A2001-52.pdf> , accessed on 24 Dec 2021
- https://www.youtube.com/watch?v=d0Bh3TQ_oEU&ab_channel=ErgoELearning by Dr.Sonal Desai accessed on 24 Dec 2021
- https://www.youtube.com/watch?v=sB0foj6GTi8&ab_channel=AMOLPARKHE accessed on 24 Dec 2021
- https://www.youtube.com/watch?v=ZKUzm5vh3qc&ab_channel=J%C3%A4mtkraftAB accessed on 24 Dec 2021
- https://www.youtube.com/watch?v=lovqoSrQI_w&ab_channel=ClassgoEducation accessed on 24 Dec 2021

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

Nil

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Mr.A.M.Arekar	HoD, Electrical Engg.Deptt.	Government Polytechnic, Nagpur
2	Dr.G.V.Gotmare	HoD, Electrical Engg. Deptt.	Government Polytechnic, Gondia
3	Mr.M.N.Gawande	Lecturer in Electrical Engg.	Government Polytechnic, Nagpur
4	Smt.A.A.Alegaonkar	Lecturer in Electrical Engg.	Government Polytechnic, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)



GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : DIPLOMA IN ME/CE/EE/PK/MT/TX/IT/CM /
MC/AI/EC/TR

COURSE CATEGORY: OPEN ELECTVIVE COURSE

COURSE CODE : OE217G

COURSE TITLE : ELECTRIC VEHICLES**

TEACHING SCHEME: TH: 02; TU: 00; PR: 00 (CLOCK HRs.)

TOTAL CREDITS : 02 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)

TH. TEE : 01 HR (Objective Type Online Examination)

PR. TEE : --

PT. : 20 Min (Objective Type)

❖ RATIONALE:

Automobile engineering technicians, being a professional who deals with a motor vehicle related activities during its life cycle should be thoroughly conversant with different Auto. Transmission system & all sub Systems associated. This is Advance Technology course that deals with construction and working of transmission system in general and its sub systems in particular that equip AET to deal with them satisfactorily. The course aims to impart basic skills and understanding of automobile transmission systems basic components their working principle, classification and performance characteristics.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Apply the knowledge of Electric vehicle system.
2. Select various EV layouts and different types of drives.
3. Identify the various systems of EV and their parts.
4. Disassemble & assemble the components of EV.
5. Service EV modern cars and bikes.
6. Diagnose faults in battery, gear boxes, differential and the wheels.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. Introduction to Electrical Vehicles	1a. Define given term of EV. 1b. Describe given layout of EV. 1c. Describe various FEMA regulations.	1.1 Introduction: 1.1.1 Electric Vehicles - Need, Types – Cost and Emissions – End of life. 1.1.2 EV's general layout / differences compared to IC engine vehicles and Hybrids 1.1.3 FEMA Regulations.	04
2.EV Layout	2a. Describe the layout of given EV 2b. Classify different layouts in EV. 2c. State the Functions of given parts.	2.1 Two wheeler Electric Vehicle– layouts, cables, components and Controls and Functions of above parts. 2.2 Four wheeler Electric Vehicle – layouts, cables, components and Controls and Functions of above parts.	04
3. EV Motors and Drives	3a. Describe the construction and working of given motors used in EV. 3b. Classify EV motors on the given basis. 3c. Identify faults in EV electric motor based on symptoms and suggest remedy.	3.1 Electric Vehicle Motors – Motors (DC, Induction, BLDC) – Types, Principle, Construction, Control. 3.2 Electric Drive Trains (EDT) – Series HEDT (Electrical Coupling) – Power Rating 3.3 Design, Peak Power Source (PPS); Parallel HEDT (Mechanical Coupling) – Torque Coupling and Speed Coupling. 3.3.1 Switched Reluctance Motors (SRM) Drives – Basic structure, Drive Converter, Design 3.3.2 Parts of a typical hub mounted BLDC traction motor- Specifications construction, working and testing.	06
4. EV Motor Control Unit	4a. State the necessity of Motor control unit in given EV.	4.1 Traction Motor Controller : Basic Functionalities of Motor Control Unit	06

	4b. Identify components of High voltage circuit in given EV. 4c. Describe construction and working of the given EV motor inverter.	4.2 High voltage circuit in EV car and Low voltage Circuit in EV car, Multiple CAN network, Torque delivery, Launch control, On the fly power levels, DC-DC Converter, Power distribution modules. 4.3 Motor invertors – Need, construction, types, specifications and working and testing.	
5. EV Battery and Its Management System	5a. Describe Construction of given battery pack. 5b. Describe battery management system. 5c. Describe General recycling methods of recycling of EV batteries.	5.1 Battery Pack And Battery Management System 5.1.1 Selection of battery for EVs & HEVs, Traction Battery Pack design, 5.1.2 Requirement of Battery Monitoring, Battery State of Charge Estimation methods 5.1.3 Battery Cell equalization problem, 5.1.4 Energy storage system and management system 5.1.5 Battery thermal control, protection interface, SOC Estimation, Energy & Power estimation, 5.2 Parts: Power Module, Battery, DC/DC Converter, load, communication channel, 5.3 Battery Pack Safety and Battery Standards 5.3.1 Thermal Runway: High discharge rates, Short circuits, charging and discharging. 5.3.2 General recycling methods of recycling of EV batteries.	06
6. EV Charging	6a. State given Electric Vehicle supply system. 6b. Classify EV charging system pressure on given basis. 6c. Enlist EVSE Standards and their	6.1 Electric Vehicle Supply Equipment (EVSE) classification - Rapid fast charging, Battery swapping, Range extension (RE) systems and Wireless charging on following parameters : • By EVSE output - AC	06

	application.	or DC • By EVSE power rating – levels 1, 2, 3 • By charging speed – slow, fast or ultra-fast • By charging communication and connector type – CCS, GB/T, CHAdeMO 6.2 EVSE safety standards : IEC 61140, IEC 61000-6-2 AC charging and connectors: IEC-62196-2 (normal + high power), IEC 60309-1, SAE J 1772 (Type 1) etc DC Charging and Connectors: IEC-62196-3 (normal + high power), GB/T 20234.3- 2015	
Total Hrs.			32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Nil

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Introduction to Electrical Vehicles	01(00)	01(00)	01(01)	03(01)
2	EV Layout	01(00)	03(00)	03(01)	07(01)
3	EV Motors and Drives	01(00)	03(00)	04(01)	08(01)
4	EV Motor Control Unit	02(00)	02(01)	02(01)	06(02)
5	EV Battery and its management System	00(00)	02(00)	02(00)	04(00)
6	EV Charging	00(00)	00(00)	02(00)	02(00)
	Total	05(00)	11(01)	14(04)	30(05)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

T-Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Options
Q 01 To Q 35	1	R	1	1	U	1	1	A	1	1	A	1	2	R	1	30/35
	2	U	1	2	U	1	2	U	1	2	A	1	2	A	1	
	2	A	1	2	A	1	3	R	1	3	U	1	3	U	1	
	3	U	1	3	A	1	3	A	1	3	A	1	3	A	1	
	3	A	1	4	R	1	4	R	1	4	U	1	4	U	1	
	4	U	1	4	A	1	4	A	1	4	A	1	5	U	1	
	5	U	1	5	A	1	5	A	1	6	A	1	6	A	1	

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	15	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assign-ments	05	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	30	12	Theory Answer Scripts	1,2,3,4,5,6
				Total	50	20		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	--	--	Journal	
		Journal Writing		Assign-ments	--	--	Journal	
				Total	--	--		
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	Practical Answer Scripts	
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

Nil

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	2	3	-	3	-	-	3	3	3
2	3	-	-	3	3	-	3	2	3
3	2	3	2	-	-	-	3	2	2
4	3	3	-	-	3	-	3	3	3
5	3	-	-	3	3	-	3	3	3
6	3	3	2	-	-	-	3	3	3

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Electric Vehicles: Modern Technologies and Trends	Nil Patel, Akash Kumar Bhoi, Sanjeevikumar Padmanaban, Jens Bo Holm-Nielsen Springer Nature, 25-Nov-2020	97881801419669
2	Electric Cars: The Ultimate Guide for Understanding	Book by Brad Durant, Createspace Independent Pub, 31 May 2014	978-1507849774
3	Electric and hybrid vehicles: fundamentals	Iqbal Husain, CRC Press, 16 August 2010	143981175X, 978-1439811757
4	Modern Electric, Hybrid Electric, and Fuel Cell Vehicles	Mehrdad Ehsani, Yimin Gao, Stefano Longo, Kambiz Ebrahimi, CRC Press, 28 March 2018	1498761771, 978-1498761772

❖ **E-REFERENCES:**

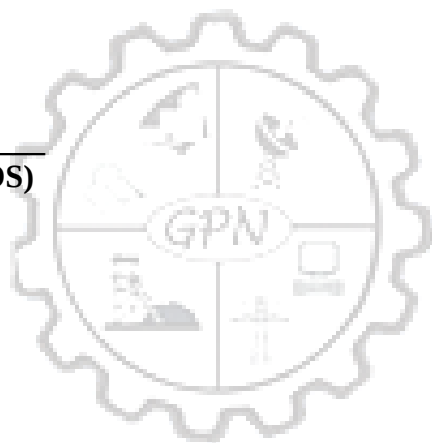
- <https://batteryuniversity.com>, dated 12 th February 2022
- <https://www.youtube.com/watch?v=3SAxXUIre28> 12 th February 2022
- <https://www.youtube.com/watch?v=tJfERzrG-D8> 12 th February 2022
- https://www.youtube.com/watch?v=j3-gbhi_nds 12 th February 2022

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**
Nil

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr.G.K.Awari	Head of Automobile Engineering	Government Polytechnic, Nagpur.
2	Mr.S.D.Thakre	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
3	Dr.K.S.Dixit	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
4	Mr.S.A.Telang	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
5	Mr.R.B.Tirpude	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.
6	Mr.Syed J.M.	Lecturer in Automobile Engineering	Government Polytechnic, Nagpur.

(Member Secretary PBOS)



(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN AE/CE/EC/MC/ME/MT/PK/TX/TR/EE/CM
COURSE CATEGORY	: OPEN ELECTIVE COURSE
COURSE CODE	: OE218G
COURSE TITLE	: ARTIFICIAL INTELLIGENCE**
TEACHING SCHEME	: TH:02;TU:00;PR:00(CLOCK Hrs.)
TOTAL CREDITS	: 02(1TH/TUCREDIT=1CLOCK HR., 1 PR CREDIT=2 CLOCK HR.)
TH. TEE EXAM	: 01HR (Objective Type Online Examination)
PR. TEE EXAM	: --
PT. EXAM	: 20Min (Objective Type)

❖ RATIONALE:

This course will introduce and define the meaning of Intelligence and explore various paradigms for knowledge encoding in computer systems. The objective of the course is to present an overview of artificial intelligence (AI) principles and approaches. Develop a basic understanding of the building blocks of AI as presented in terms problem, problem space: Search, Knowledge representation, inference, logic, and learning.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Identify the need of AI and its applications in real life.
2. Analyze and illustrate how search algorithms play vital role in problem solving.
3. Analyze the different types of intelligent agents.
4. Build knowledge of reasoning and knowledge representation for solving real world problems.
5. Illustrate various types of learning of AI.
6. Analyze the expert system tools and applications.

❖ **COURSE DETAILS:****A. THEORY:**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. Introduction	1a. Justify the given concepts of AI. 1b. Choose correct types of AI on the basis of given point. 1c. Compare AI with given topic with justification.	1.1 Definitions – Artificial Intelligence History of AI, Evolution of AI -Applications of AI 1.2 Meaning of intelligence, turning test, Intelligent Decision, Types of AI 1.3 Artificial Intelligence Vs Machine learning, Topics in AI	04
2. State Space Search	2a. Select suitable search technique on the basis of given point. 2b. Compare search method with given point. 2c. Compare heuristic search on basis of given point.	2.1 Generate and test, Simple search 2.2 Depth First search(DFS), Breadth First search(BFS) 2.3 Comparison of DFS and BFS, Quality of solution, Heuristic search	06
3. Intelligent Agents	3a. Identify the types of given intelligent agents. 3b. Justify need of AI with example.	3.1 Types of AI Agents, Agents in AI, Agents environment 3.2 Turning Tests in AI, Applications of AI-Artificial intelligence, Importance of AI	06
4. Knowledge Representation	4a. Describe issues and approaches related to given knowledge representation. 4b. Select appropriate knowledge representation technique to represent given fact.	4.1 Approaches to Knowledge representations, Issues in Knowledge representations , Frame Problem 4.2 Knowledge and Reasoning: Building a Knowledge Base: Propositional logic, first order Logic, situation calculus. Theorem Proving in First Order Logic, Planning, partial order planning	06
5. Subset of AI	5a. Classify types of learning on basis of given point. 5b. Compare given main two types of learning on basis of given point. 5c. Illustrate the concepts of given learning.	5.1 Meaning of learning, Types of learning-Narrow AI, strong AI, general AI, super AI machine learning, deep learning 5.2 Supervised and unsupervised learning, Robotics ,Machine vision, Speech Recognition	04

6. Expert System	6a. Justify need of given Expert system on basis of its given characteristics. 6b. Identify components of given expert system on basis of given point.	6.1 Introduction to Expert Systems- Need of expert system, Characteristics of expert system 6.2 Components of expert system, Limitations, Application: NLP(natural language processing)	06
		Total	32

B. LIST OF PRACTICALS /LABORATORY EXPERIENCES/ASSIGNMENTS:NIL

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Introduction	01(00)	02(00)	01(00)	04(00)
2	State space search	01(00)	02(00)	02(01)	05(01)
3	Intelligent Agents	01(00)	02(00)	03(01)	06(01)
4	Knowledge Representation	02(00)	00(01)	03(00)	05(01)
5	Subsets of AI	00(00)	03(01)	03(00)	06(01)
6	Expert Systems	01(00)	00(00)	03(01)	04(01)
	Total	06(00)	09(02)	15(03)	30(05)

R– Remember

U– Understand

A–Analyze/Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

T-Unit/Topic Number

L-Level of Question

M-Marks

R-Remember

U-Understand

A-Analyze/Apply

1 R 2 means Unit/Topic Number No-1,Level of Question–Remember, Marks–2 Marks

Q. No	Bit1			Bit2			Bit3			Bit4			Bit5			Bit6			Options
Q.No.1 to Q.No.35	1	R	1	1	U	1	1	U	1	1	A	1	2	R	1	2	U	1	30/35
	2	U	1	2	A	1	2	A	1	2	A	1	3	R	1	3	U	1	
	3	U	1	3	A	1	3	A	1	3	A	1	3	A	1	4	R	1	
	4	R	1	4	A	1	4	A	1	4	A	1	4	U	1	5	U	1	
	5	U	1	5	U	1	5	A	1	5	A	1	5	A	1	5	U	1	
	6	R	1	6	A	1	6	A	1	6	A	1	6	A	1				

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	15	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	05	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	30	12	Theory Answer Scripts	1,2,3,4,5,6
				Total	50	20		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	--	--	Journal	
		Journal Writing		Assignments	--	--	Journal	
				Total	--	--		
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	Practical Answer Scripts	
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:Nil**❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes(PSOs)		
	1	2	3	4	5	6	7	1	2	3
1	3	-					3	--	-	-
2	3	-	-	-	-	-	3	-	-	-
3	3	-	-	-	-	-	3	-	-	-
4	3	-	-	-	-	-	3	-	-	-
5	3	--	-	-	-	-	3	-	-	-
6	3	-	-	-		-	3	-	-	-

1:Slight(Low) 2:Moderate(Medium) 3:Substantial(High)

❖ **REFERENCE&TEXTBOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Artificial Intelligence A Modern Approach	S.Russell and P.Norvig., Pearson Education, 4 th edition, 2020	13:978-0-13-604259-4
2	First Course in AI	Deepak Khemani, McGraw Hill, 2013	13:978-93-832-8678-2 10:93-832-8678-4
3	Artificial Intelligence	E. Rich and K. Knight and Shivashankar B. Nair., 3 rd edition, Tata McGraw Hill	13:978-007-008-770-5
4	Introduction to Artificial Intelligence & Expert Systems	Dan W. Patterson, PHI., 1990 Learning, 1st ed. 2011	9789332551947

❖ **E-REFERENCES:**

- <https://www.javatpoint.com/types-of-ai-agents>, accessed on 25 Jan. 2022
- http://www.dkriesel.com/en/science/neural_networks, accessed on 25 Jan. 2022
- https://www.youtube.com/results?search_query=artificial+intelligence, accessed on 25 Jan 2022
- <https://www.youtube.com/watch?v=s-s9ilkMVj8>, accessed on 25 Jan. 2022

❖ **LIST OF MAJOR EQUIPMENTS / INSTRUMENTS WITH SPECIFICATION : Nil**❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute/Industry
1	Dr.A.R.Mahajan	Head of Department (I.T.Dept.)	Chairman, Course Expert
2	Mr.Dipak Dhote	Operations Manager, IT-Network Infosystems Pvt LTD	Industry Expert
3	Dr.Rakesh Kadu	Assistant Professor, I.T., Ramdeobaba College of Engg, and Management, Nagpur.	Member from Academics(External)
4	Mrs.V.A.Raje	Lecturer in C.O., G.P.Arvi	MSBTE Nominee
5	Mr.L.D.Vilhekar	Lecturer in Information Tech.	Member(Internal)
6	Mrs.D.P.Chanmanwar	Lecturer in Information Tech.	Member(Internal))
7	Mr.M.N.Gawande	Lecturer in Electrical Engg.	CDC In Charge and Member Secretary
8	Mrs.Isha L.Sangolkar	Lecturer in Information Tech.	Course Expert

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.**(An Autonomous Institute of Govt. of Maharashtra)****COURSE CURRICULUM**

PROGRAMME	: DIPLOMA IN AE/ME/CE/EC/MT/PK/EE/TX/AI/CM/IT/TR
COURSE CATEGORY:	OPEN ELECTIVE COURSE
COURSE CODE	: OE222G
COURSE TITLE	: MECHATRONICS**
TEACHING SCHEME:	TH:02; TU: 00;PR: 00(CLOCK HRs.)
TOTAL CREDITS	: 02(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 01 HR (Objective Type Online Examination)
PR. TEE EXAM	: --
PT. EXAM	: 20 min Objective Type)

❖ RATIONALE:

Mechatronics is multi disciplinary field that focuses on the integration of mechanical, electronics and electrical engineering system. It includes a combination of robotics, electronics, computer science, telecommunications, control and product engineering. This subject develops skills in students about to produce a design solution that unifies each of these various subfields. A mechatronics engineer unites the principles of subfields to generate a simpler, more economical and reliable system.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Use various control systems for suitable applications.
2. Troubleshoot problems in various sensors and transducers.
3. Select a particular motor depending upon the system design requirements.
4. Develop a program to perform a task using different instructions in PLC.

❖ **COURSE DETAILS:**

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. Introduction to Mechatronics	1a. Use given mechatronics system. 1b. Describe given components of given system architecture. 1c. Classify given types of control system. 1d. Use application of given water level controller. 1e. Utilize controllers for given applications.	1.1 Introduction to Mechatronics, Importance of Mechatronics. 1.2 Mechatronics system architecture - Sensors, Signal conditioners, PLC/ Embedded controllers, Pneumatic, Hydraulic and electrical actuators. 1.3 Control systems – open and closed loop systems, Basic elements of Closed-loop control System. 1.4 Automatic water level controller. Sequential controllers-washing machine. 1.5 Advantages and disadvantages of Mechatronics.	06
2. Sensors and Transducers	2a. Describe functions of given sensors and transducers. 2b. Categorize given performance terminology. 2c. Describe troubleshooting procedure of given displacement sensors. 2d. Describe given sensors for suitable application. 2e. Select suitable temperature sensor for given application.	2.1 Introduction to Sensors and Transducers. Selection criteria of Sensors. 2.2 Performance terminology – Range and span, Error, Accuracy, Sensitivity, Hysteresis error, Repeatability. 2.3 Displacement sensors:- LVDT, RVDT. Position sensors:- Hall effect sensor, Eddy current . 2.4 Proximity sensors:- Capacitive and Inductive, Optical encoder, Force Sensors. 2.5 Temperature Sensors:- Thermocouple, RTD.	10
3. Actuation Systems	3a. Describe various components of given actuation system. 3b. Use given bearings for given application. 3c. Classify various components of given electrical actuation system. 3d. Select a particular	3.1 Mechanical Actuation Systems - Types of motion, Freedom and constraints, Loading, GearTrains, Pawl & Ratchet, Belt and Chain drives. 3.2 Bearings –Types of bearings and applications. 3.3 Electrical Actuation Systems - Switches & Relays, Solenoids, Introduction of D.C. Motors and	08

	motor depending upon the given system design requirements. 3e. Classify given types of servomotor. 3f. Maintain given systems on the basis of component faults.	A. C. Motors. 3.4 Stepper Motors - Specifications and Control of stepper motors. 3.5 Servomotors - D.C. Servomotor and A.C Servomotor. 3.6 Pneumatic & Hydraulic Systems - Power supplies, DCV, PCV, cylinders.	
4. Programmable Logic Controller (PLC)	4a. Describe structure of given system. 4b. Develop the given ladder logic for given instructions of PLC. 4c. Develop a program to perform a given task using different instructions in PLC. 4d. Use given components of PLC. 4e. Select appropriate PLC for given application.	4.1 Definition, Basic block diagram and structure of PLC, Input/Output processing. 4.2 Types of PLC Programming, Ladder diagram, its logic functions. 4.3 Latching and Sequencing, PLC mnemonics. 4.4 Timers, Internal relay and Counters, Shift registers, Master and Jump Controls. 4.5 Data handling, analog input/output, Selection of PLC.	08
		Total Hrs	32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Nil

❖ **SPECIFICATION TABLE FOR THEORY PAPER:**

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Introduction to Mechatronics	01(00)	03(01)	03(00)	07(01)
2	Sensors and Transducers	01(00)	04(00)	03(01)	08(01)
3	Mechanical and Electrical Actuation Systems	01(00)	04(00)	03(01)	08(01)
4	Programmable Logic Controller (PLC)	01(00)	03(01)	03(01)	07(02)
	Total	04(00)	14(02)	12(03)	30(05)

R – Remember

U – Understand

A – Analyze / Apply

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:**

T- Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Options
Q. 01 To Q. 35	1	R	1	1	U	1	1	U	1	1	U	1	1	A	1	1	A	1	30/35
	2	R	1	1	U	1	1	A	1	2	U	1	2	U	1	2	U	1	
	3	R	1	2	U	1	2	A	1	2	A	1	2	A	1	2	A	1	
	4	R	1	3	U	1	3	U	1	3	U	1	3	U	1	3	A	1	
	3	A	1	3	A	1	3	A	1	4	U	1	4	U	1	4	U	1	
	4	U	1	4	A	1	4	A	1	4	A	1	4	A	1				

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	15	--	Test Answer Scripts	1, 2, 3,4
		Class Room Assignments		Assignments	05	--	Assignment Book	1, 2, 3,4
	TEE (Term End Examination)	End Exam	Students	End of the Course	30	12	Theory Answer Scripts	1, 2, 3,4
				Total	50	20		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	--	--	Journal	--
		Journal Writing		Assignments	--	--	Journal	--
				Total	--	--		--
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	Practical Answer Scripts	--
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form		--	
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

Nil

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	-	-	3	-	-	-	2	-
2	3	2	-	3	1	-	2	2	2
3	3	2	2	3	-	2	2	-	-
4	3	-	-	-	-	-	-	-	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Mechatronics	W. Bolton, Pearson Education, India, Fourth Edition, 2008	8131762572 9788131762578
2	Mechatronics (Integrated Mechanical Electronics System)	K.P. Ramchandran, G. K. Vijayraghavan, M.S. Balsundaram, Wiley India Pvt. Ltd., First Indian Edition, 2008	8126518375 9788126518371
3	Mechatronics : An Introduction	Robert Bishop, CRC press, 2008	0849363586
4	Mechatronics	J. Paulo Davim, Wiley India Pvt. Ltd. 2011	1848213085 9781848213081
5	Robotics	Appu Kuttan K. K., I. K. International Pvt. Ltd., First Edition, 2010	8189866389 9788189866389

❖ **E-REFERENCES:**

- nptel.ac.in/courses/112103174 , accessed on 30th August, 2021
- nptel.ac.in/courses/pdf/mod7 , accessed on 30th August, 2021
- video_demos.colostate.edu/mechatronics , accessed on 30th August, 2021

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

Nil

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr.R.V.Yenkar	Head of Electronics & Telecomm Engineering	Government Polytechnic, Nagpur
2	Dr.V.H.Mankar	Head of Electronics & Telecomm Engineering	Government Polytechnic, Nagpur.
3	Mrs.U.P.Potdar	Lecturer in Electronics & Telecomm Engineering	Government Polytechnic, Nagpur
4	Mrs.J.A.Raut	Lecturer in Electronics & Telecomm Engineering	Government Polytechnic, Nagpur
5	Mr.S.V.Darvhekar	Director	Beta Computronics Pvt. Ltd.Nagpur
6	Mrs.Gazala Ali	Head of Electronics & Telecomm Engineering,	Ajuman Polytechnic, Nagpur.
7	Mr.K.S.Pachpor	Lecturer in Electronics,	Government Polytechnic, Achalpur.

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN AE/CE/EC/EE/MC/ME/MT/PK/TX/TR
COURSE CATEGORY	: OPEN ELECTIVE COURSE
COURSE CODE	: OE223G
COURSE TITLE	: TECHNOLOGICAL EVOLUTION IN COMPUTER**
TEACHING SCHEME	: TH: 02; TU: 00;PR: 00 (CLOCK HRs.)
TOTAL CREDITS	: 02 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 01 HR (Objective Type Online Examination)
PR. TEE EXAM	: --
PT. EXAM	: 20 Min (Objective Type)

❖ **RATIONALE:**

The course is designed for students to cover the concepts of Technological evolution in computers and to understand technological developments in the field of Information Technology. This course also highlights the students to know how developments in the field of software evolved as the technology advancements.

❖ **COURSE OUTCOMES :-**

After completing this course students will be able to–

1. Identify the concepts, terminology and Generation of Computers their features and applications.
2. Interpret the importance of Chipsets and their functions.
3. Summarize the types of Processors, Storage devices and Ports used in Computers.
4. Apply the Knowledge of Operating System and Identify its types based on technological evolution.
5. Identify the Role and Functions of I/O devices used in Computers.
6. Analyze the case studies of super computer based on the tools i.e. Questionnaire, Survey .

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. Evolution of Computers	1a. Describe the history of computers w.r.t given data. 1b. Identify the ongoing generation of computers from the given data. 1c. Select important features of computers from the given data. 1d. Determine the applications of computers on the basis of the given points.	1.1 Introduction, History of Computers • Abacus • Napier's Bones • Pascaline • Stepped Reckoner or Leibnitz wheel • Difference Engine • Analytical Engine • Tabulating Machine • Differential Analyzer • Mark I 1.2 Generation of Computers 1.3 Features of Computers (Characteristics) 1.4 Applications of Computers • Home • Medical Field • Entertainment • Industry • Education • Government • Banking • Business	04
2. Introduction to Chipsets	2a. Determine the concept of chipset from the given data. 2b. Identify the chipset used in computers based on evolution. 2c. Determine the concept of Mobile chipset from the given data. 2d. Select the chipsets on the basis of their given functions.	2.1 Basic Concepts of Chipset 2.2 Types of Chipset – (Concepts and Features) • 80286 • 386 • 486 • 586 • Pentium II,III,IV,V • Celeron, Dual Core • Core 2 Duo • Intel i3,i5 & i7 2.3 Mobile chipset (Concepts) • A15 Bionic • Dimensity 9000 Plus • Snapdragon 8 Plus Gen 1 • Exynos 2200 2.4 Functions of chipset used in computers	05

3. Processors, Storage and Ports	3a. Identify the processors based on their given evolution. 3b. Select the primary and secondary storage devices on the basics of their given functions. 3c. Select ports used in computers based on different given output devices.	3.1 Processor : Basic concepts of processors – Starting from 8085 to latest i9 3.2 Storage Memory devices – - Types of RAM, ROM, - Secondary Storage Devices (HDD,SSD, Pen drive and Memory cards) 3.3 Basic of ports : - VGA - Serial/Parallel port - USB - HDMI	05
4. Operating System	4a. Identify the function of Operating System. 4b. Select the OS used in computer and mobile system from the given. 4c. Identify the commands used in Single user and Multiuser OS modes on the basis of the given points. 4d. Select the type of OS from the given data for GUI based OS.	4.1 Concepts of Operating System (OS) 4.2 Type of OS : - Batch OS - Multiprogramming OS - Time Sharing OS - Multiprocessor OS - Distributed OS - Real Time System - Mobile OS (Androids and IOS) 4.3 Command Line based OS : - DOS and UNIX 4.4 Graphical use Interface (GUI) based OS - Windows and Linux	06
5. I/O Devices	5a. Select the I/O devices with their functions from the given data. 5b. Analyze the types of Input devices used in computers from the given data. 5c. Identify the types of Output devices used in computers from the given data.	5.1 Basics of I/O Device - Role / Function of I/O Devices 5.2 Input devices – - Keyboard - Point and draw (Mouse and Track ball) - Data Scanning Devices - Digitizers - Speech Recognition devices - Vision based devices 5.3 Output Devices – - Monitor - Printer - Plotter - Screen Image Projects and Voice respond system	06
6. Case Studies of Super- Computers	6a. Compare the concept of ARPANet, Distributed computing and cloud computing on the basis of given points.	6.1 Concepts of ARPANet - Distributed computing - Cloud computing - Virtualization 6.2 Concept of Super Computer - What is a supercomputer	06

	6b. Analyze the concept of Super Computers from the given data. 6c. Select the super Computers based on given parameters.	- How supercomputers work (Brief) - Differences between general-purpose computers and supercomputers 6.3 Various Super Computer – (Brief introduction) - Param (India) - Tianhe-2 (China) - Sunway Taihulight (China) - Sierra (US) - Summit (US) - Fugaku (Japan)	
		Total Hrs.	32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS: Nil

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
1	Evolution of Computers	01(00)	01(00)	00(00)	02(00)
2	Introduction to Chipsets	02(00)	02(00)	02(01)	06(01)
3	Processors, Storage and Ports	01(00)	02(00)	04(01)	07(01)
4	Operating System	01(00)	01(01)	03(00)	05(01)
5	I/O Devices	00(00)	02(00)	03(01)	05(01)
6	Case studies of Super-Computers	01(00)	01(01)	03(00)	05(01)
	Total	06(00)	09(02)	15(03)	30(05)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

T-Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Options
Q 01 To Q 35	1	R	1	2	R	1	1	U	1	6	A	1	2	R	1	30/35
	2	U	1	2	U	1	6	A	1	6	A	1	2	A	1	
	2	A	1	2	A	1	3	R	1	3	U	1	3	A	1	
	3	U	1	3	A	1	3	A	1	3	A	1	3	A	1	
	4	R	1	4	U	1	4	U	1	4	A	1	4	A	1	
	4	A	1	5	U	1	5	U	1	5	A	1	5	A	1	
	5	A	1	5	A	1	6	R	1	6	U	1	6	U	1	

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	15	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assign-ments	05	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	30	12	Theory Answer Scripts	1,2,3,4,5,6
				Total	50	20		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	--	--	Journal	
		Journal Writing		Assign-ments	--	--	Journal	
				Total	--	--		
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	Practical Answer Scripts	
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form		1,2,3,4,5,6	
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

Nil

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							PSO	PSO	PSO
	1	2	3	4	5	6	7	1	2	3
1	3	3	3	-	-	-	-	3	-	-
2	3	3	-	-	-	-	-	3	-	-
3	3	-	-	-	-	-	-	3	-	-
4	3	3	3	-	-	-	-	-	-	-
5	3	3	3	-	-	-	-	3	-	-
6	-	3	-	-	-	-	-	-	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

Sr.No	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	The Evolution of Computer Technology (Evolving Technology)	Haq Kamar Britannica Educational Pub 15 August 2018	ISBN-10 : 1538302837 ISBN-13 : -978 1538302835
2	Chipset (The Homeland Connection Book 4)	Lior Samson Gesher Press - Kindle Edition (15 December 2012)	---
3	Fundamentals of Computers	E Balagurusamy McGraw Hill Education (24 June 2009)	ISBN-10 : 9780070141605 ISBN-13 : -978 0070141605
4	Computer Fundamentals	Pradeep K Sinha & Priti Sinha Sixth Edition BPB Publication	---
5	Operating System Concepts	Abraham Silberschatz, Peter B. Galvin & Greg Gagne Wiley; 9th edition (December 17, 2012) 9th Edition	ISBN-10 : 1118063333 ISBN-13 : -978 1118063330
6	A Practical Guide to Building I/O Devices	John Hyde Intel Press, 2001 John Hyde Intel Press, 2001 2, illustrated	0970284659, 9780970284655

7	The Architecture of Supercomputers: Titan, a Case Study	Daniel P. Siewiorek & Philip John Koopman Jr. Academic Press (April 7, 2015)	ISBN-10 : 1483246590 ISBN-13 : -978 1483246598
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❖ **E-REFERENCES:**

- https://www.brainkart.com/article/Case-Studies-of-Top-Supercomputer-Systems_11327 accessed date 01/08/2022
- https://www.cs.uic.edu/~jbell/CourseNotes/OperatingSystems/13_IOSystems.html accessed date 03/08/2022
- https://en.wikipedia.org/wiki/List_of_Intel_chipsets accessed date 04/08/2022
- <https://www.giznext.com/mobile-chipsets> accessed date 04/08/2022

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**
Nil

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr.M.V.Sarode	Head of Department (Computer Engg.Dept.)	Government Polytechnic Nagpur
2	Mr.M.A.Rahman	Lecturer in Computer Engineering	Government Polytechnic Nagpur
3	Mr.A.A.Uike	Lecturer in Computer Engineering	Government Polytechnic Nagpur
4	Mr.P.S.Thakre	Lecturer in Computer Engineering	Government Polytechnic Nagpur
5	Mr.Dipak Dhote	Operations Manager,	IT-Network Infosystems Pvt LTD, Nagpur
6	Dr.Rakesh Kadu	Assistant Professor, I.T.	Ramdeobaba College of Engg, and Management, Nagpur.
7	Mrs.V.A.Raje	System Analyst	MSBTE,RO Nagpur

(Member Secretary PBOS)

(Chairman PBOS)