# PROGRAMME PROJECT REPORT

**(includes curriculum and syllabus)**



# P.G. Diploma in AI & Data Science

**Submitted**

**To**

**The UGC – DEB**

*(ODL) - MODE*

**MADHYA PRADESH BHOJ (OPEN) UNIVERSITY,**

**Raja Bhoj Marg Kolar Road, BHOPAL (M.P.)**

**Madhya Pradesh Bhoj Open University, Bhopal**
**PROGRAMME PROJECT REPORT**
**Name of the Programme:  P.G.Diploma in AI & Data Science**

**Introduction :**

P.G.Diploma in AI & Data Science is a  postgraduate  program  that  focuses  on developing the skills and knowledge required to manage and analyze information technology  in  various industries. The program covers a wide range of topics such as software development, database management, computer networks, cybersecurity, and artificial intelligence.

Students who enroll in an P.G.Diploma in AI & Data Science program are  typically individuals who already have an undergraduate  degree in computer science, information technology, or a related field. The program typically takes one to two years to complete, and students are required to complete coursework, research projects, and a dissertation.

The program is designed to equip graduates with the necessary skills to become IT professionals, and prepares them for roles such as systems analyst, database administrator, network administrator,  cyber security specialist, and software developer. An P.G.Diploma in AI & Data Science  degree is highly valued in the job market, and graduates can expect to earn competitive salaries in their chosen field.

**(i)  (a) Programme's Mission**: The mission of an  P.G.Diploma in AI & Data Science   program is to provide students with a comprehensive understanding of information technology and its applications in various industries. The program aims to equip students with the necessary skills to analyze, design, and develop IT systems that are efficient, effective, and secure.

The program is designed to prepare students for careers in the rapidly evolving field of information technology, where there is a constant demand for professionals who can adapt to new technologies and solve complex problems. The program emphasizes practical, hands-on experience, and encourages students  to  engage  in research and development activities.

In addition, the program aims to develop students' communication and teamwork skills, as these are essential for success in the field of IT. Graduates of the program are expected to be leaders in their field, with the ability to innovate, manage and lead IT projects.

Overall, the mission of an P.G.Diploma in AI & Data Science   program is to produce graduates who are  well-rounded IT professionals, capable of contributing to the growth and success of organizations in various industries.

**(b) Objectives:**

The objectives of an P.G.Diploma in AI & Data Science in IT (Information Technology) program vary depending on the specific program and institution offering it. However, some common objectives of P.G.Diploma in AI & Data Science programs include:

- Developing advanced knowledge and skills: P.G.Diploma in AI & Data Science programs aim to provide students with advanced knowledge and skills in areas such as computer networks, database management, programming, artificial intelligence, cybersecurity, and more.
- Preparing for leadership roles: P.G.Diploma in AI & Data Science programs often prepare students for leadership roles in the IT industry by providing them with the knowledge, skills, and confidence to lead teams and make strategic decisions.
- Promoting innovation: P.G.Diploma in AI & Data Science programs encourage students to think creatively and innovatively by exposing them to cutting-edge technologies and research.
- Enhancing career prospects: P.G.Diploma in AI & Data Science programs are designed to enhance students' career prospects by providing them with specialized knowledge and skills that are in high demand in the IT industry.
- Encouraging lifelong learning: P.G.Diploma in AI & Data Science programs promote a culture of lifelong learning by providing students with the tools and resources they need to stay up-to-date with the latest advancements in the IT industry.

**(ii) Relevance of the Programme with HEI's Mission and Goals**: The relevance of an P.G.Diploma in AI & Data Science program with an HEI's (Higher Education Institution) mission and goals depends on the specific institution's mission and goals. However, in general, P.G.Diploma in AI & Data Science programs are highly relevant to many HEI's missions and goals for the following reasons:

Meeting the needs of the IT industry: Many HEIs aim to prepare their graduates to meet the needs of the industries they will work in. P.G.Diploma in AI & Data Science programs do exactly that by equipping students with advanced knowledge and skills in areas such as computer networks, cybersecurity, and artificial intelligence, which are highly sought after by employers in the IT industry.

Supporting research and innovation: Many HEIs aim to support research and innovation by providing their students with access to cutting-edge technologies and research facilities. P.G.Diploma in AI & Data Science programs often involve research projects, internships, and other opportunities for students to explore and develop innovative solutionsto real-world problems.

Enhancing the institution's reputation: Many HEIs aim to enhance their reputation by offering high-quality academic programs that produce successful graduates. P.G.Diploma in AI & Data Science programs are highly regarded in the IT industry, and graduates of these programs are often sought after by employers, which can enhance the institution's reputation.

Encouraging lifelong learning: Many HEIs aim to promote a culture of lifelong learning by providing their students with the tools and resources they need to continue learning throughout their careers. P.G.Diploma in AI & Data Science programs often involve ongoing professional development opportunities and access to industry experts, which can help students stay up-to-date with the latest advancements in the IT industry.

Overall, an P.G.Diploma in AI & Data Science program can be highly relevant to an HEI's mission and goals, particularly if the institution aims to prepare its graduates for successful careers in the IT industry, support research and innovation, and promote lifelong learning.

**(iii) Nature of prospective target group of learners:**

The prospective target group of learners for an P.G.Diploma in AI & Data Science program can vary depending on the specific program and institution offering it. However, in general, the target group of learners for an P.G.Diploma in AI & Data Science program are individuals who:

- Have an undergraduate degree in computer science, information technology, or a related field: P.G.Diploma in AI & Data Science programs typically require applicants to have an undergraduate degree in a relevant field. This ensures that students have a solid foundation in IT fundamentals before embarking on more advanced coursework.

- Are interested in advancing their knowledge and skills in IT: P.G.Diploma in AI & Data Science programs are designed for individuals who want to deepen their understanding of IT concepts, technologies, and applications. Prospective students may be interested in pursuing careers in areas such as software development, network administration, cybersecurity, or data analytics.

- Are motivated and self-directed learners: P.G.Diploma in AI & Data Science programs require a high level of self-direction and motivation, as students must complete complex coursework, research projects, and other assignmentswith minimal supervision.

- Have strong analytical and problem-solving skills: P.G.Diploma in AI & Data Science programs involve complex problem-solving and require students to think critically and analytically. Prospective students should have strong analytical and problem-solving skills to succeed in the program.

- Are interested in pursuing leadership roles in the IT industry: P.G.Diploma in AI & Data Science programs often prepare students for leadership roles in the IT industry by providing them with the knowledge, skills, and confidence to lead teams and make strategic decisions. Prospective students who are interested in pursuing leadership roles in the IT industry may find an P.G.Diploma in AI & Data Science program particularly appealing.

Overall, the target group of learners for an P.G.Diploma in AI & Data Science program is typically composed of motivated, self-directed learners with a strong foundation in IT fundamentals who are interested in advancing their knowledge and skills in IT and pursuing careers in the field

**Appropriateness of programme to be conducted in the Open and Distance Learning mode to acquire specific skills and competence:**

The P.G.Diploma in AI & Data Science program can be appropriately conducted in the Open and Distance Learning (ODL) mode to acquire specific skills and competence. Here are some reasons why:

- Flexibility: The ODL mode provides flexibility in terms of time, pace, and place of learning, which is especially important for learners who are already working or have other commitments. This mode allows learners to design their own study schedules and access course materials at their convenience, which can help them to balance their work, family, and educational commitments.

- Access to learning resources: ODL mode can provide access to a wide range of learning resources, including digital textbooks, audio and video lectures, interactive simulations, and virtual laboratories. This mode allows learners to access these resources from anywhere, which can help them to deepen their understanding of key concepts and develop specific skills and competencies.

- Personalized learning: ODL mode can provide personalized learning experiences to learners by using adaptive learning technologies, providing individual feedback, and offering personalized tutoring. This mode can help learners to focus on their specific needs and interests and acquire the skills and competence they need to succeed in their chosen field.

- Cost-effective: ODL mode can be a cost-effective option for learners who are unable to attend traditional, on-campus programs. This mode can reduce the cost of tuition, accommodation, and transportation, making it more accessible to learners from diverse socioeconomic backgrounds.

- Practical components: Although some practical components of the P.G.Diploma in AI & Data Science program may require access to laboratory equipment, there are still many theoretical components of the program that can be delivered effectively through the ODL mode. Furthermore, some universities offer online laboratories and simulations that can be used to supplement or replace the practical components of the program.

Overall, the P.G.Diploma in AI & Data Science program can be appropriately conducted in the ODL mode, providing learners with the opportunity to acquire specific skills and competence in a flexible, accessible, personalized, and cost-effective manner.

**(iv) Instructional Design:** The P.G.Diploma in AI & Data Science programme is aTwo-year degree programme of 86 credits. The course material for the programme has been developed in-house with contributions from seasoned academicians as well. The instructional design comprises all learning activities i.e., reading and comprehending the SLM, availing audio-visual aids to enhance knowledge, attending counselling sessions and preparing assignments.

The Programme is of 2  year duration with semester examinations. The maximum period  allowed  is  4 years(double the duration). The Programme structure is as below.

**P.G.DIPLOMA IN AI & DATA SCIENCE**

| Sr. No. | Sub. Code | Name of the subject | CREDIT | Teaching scheme (per week) | | | | Examination Scheme | | | | Total Marks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Theory | | Practical | | |
| | | | | | | | | CIE | End Sem | CIE | End Sem | |
| | | | | Th. | Tut. | Pr. | Total (hr.) | Th. | Th. | Pr. | Pr. | |
| 1 | PGDAIDS101 | FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE | 4 | 3 | 0 | 0 | 5 | 60 | 40 | 0 | 0 | 100 |
| 2 | PGDAIDS102 | Fundamental of Computer Networking | 4 | 4 | 0 | 0 | 4 | 60 | 40 | 0 | 0 | 100 |
| 3 | PGDAIDS103 | Programming in C | 4 | 3 | 0 | 3 | 3 | 60 | 40 | 60 | 40 | 200 |
| 4 | PGDAIDS104 | RELATIONAL DATABASE MANAGEMENT SYSTEM (RDBMS) | 4 | 4 | 2 | 5 | 6 | 60 | 40 | 60 | 40 | 200 |
| 5 | PGDAIDS105 | Programming in C LAB | 4 | 0 | 0 | 4 | 4 | 60 | 40 | 60 | 40 | 200 |
| | | TOTAL | 20 | 14 | 2 | 12 | 28 | 300 | 200 | 180 | 120 | 800 |

The first two rows above the column header (M.P.BHOJ(OPEN) UNIVERSITY, BHOPAL and P.G.DIPLOMA IN AI & DATA SCIENCE SEMESTER-I SYLLABUS) are title banners spanning the table:

**M.P.BHOJ(OPEN) UNIVERSITY, BHOPAL**

**P.G.DIPLOMA IN AI & DATA SCIENCE SEMESTER-I SYLLABUS**

| M.P.BHOJ(OPEN) UNIVERSITY, BHOPAL | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **P.G.DIPLOMA IN AI & DATA SCIENCE SEMESTER-II SYLLABUS** | | | | | | | | | | | | |
| Sr. No. | Sub. Code | Name of the subject | CREDIT | Teaching scheme (per week) | | | | Examination Scheme | | | | Total Marks |
| | | | | | | | | Theory | | Practical | | |
| | | | | | | | | CIE | End Sem | CIE | End Sem | |
| | | | | Th. | Tut. | Pr. | Total (hr.) | Th. | Th. | Pr. | Pr. | |
| 1 | PGDAIDS201 | **OBJECT ORIENTED PROGRAM IN C++** | 4 | 3 | 0 | 4 | 7 | 60 | 40 | 60 | 40 | 200 |
| 2 | PGDAIDS202 | **Introduction to Python Programming** | 4 | 3 | 0 | 2 | 5 | 60 | 40 | 60 | 40 | 200 |
| 3 | PGDAIDS203 | **Basics of Data Science** | 4 | 3 | 0 | 0 | 3 | 60 | 40 | 0 | 0 | 100 |
| 4 | PGDAIDS204 | **Data Structure** | 4 | 3 | 0 | 2 | 5 | 60 | 40 | 60 | 40 | 200 |
| 5 | PGDAIDS205 | **Python Programming LAB** | 4 | 3 | 0 | 0 | 5 | 60 | 40 | 0 | 0 | 100 |
| | | **TOTAL** | **20** | **15** | **0** | **08** | **25** | **300** | **200** | **180** | **120** | **800** |

| M.P.BHOJ(OPEN) UNIVERSITY, BHOPAL | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **P.G.DIPLOMA IN AI & DATA SCIENCE SEMESTER-III SYLLABUS** | | | | | | | | | | | | |
| Sr. No. | Sub. Code | Name of the subject | CREDIT | Teaching scheme (per week) | | | | Examination Scheme | | | | Total Marks |
| | | | | | | | | Theory | | Practical | | |
| | | | | | | | | CIE | End Sem | CIE | End Sem | |
| | | | | Th. | Tut. | Pr. | Total (hr.) | Th. | Th. | Pr. | Pr. | |
| 1 | PGDAIDS301 | R Programming | 6 | 4 | 0 | 4 | 8 | 60 | 40 | 60 | 40 | 200 |
| 2 | PGDAIDS302 | Cloud Infrastructure and Services | 6 | 4 | 0 | 4 | 8 | 60 | 40 | 60 | 40 | 200 |
| 3 | PGDAIDS303 | FUNDAMENTALS OF MACHINE LEARNING | 4 | 4 | 0 | 0 | 4 | 60 | 40 | 0 | 0 | 100 |
| 4 | PGDAIDS304 | PRINCIPLES OF SOFT COMPUTING | 4 | 4 | 0 | 0 | 4 | 60 | 40 | 0 | 0 | 100 |
| 5 | PGDAIDS305 | R Programming LAB | 2 | 2 | 0 | 0 | 2 | 60 | 40 | 0 | 0 | 100 |
| | | **TOTAL** | **22** | **18** | **0** | **08** | **26** | **300** | **200** | **120** | **80** | **700** |

| Sr. No. | Sub. Code | Name of the subject | CREDIT | Teaching scheme (per week) | | | | Examination Scheme | | | | Total Marks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Theory | | Practical | | |
| | | | | | | | | CIE | End Sem | CIE | End Sem | |
| | | | | Th. | Tut. | Pr. | Total (hr.) | Th. | Th. | Pr. | Pr. | |
| 1 | PGDAIDS 401 | FUNDAMENTALS OF MACHINE LEARNING | 6 | 4 | 0 | 4 | 8 | 60 | 40 | 60 | 40 | 200 |
| 2 | PGDAIDS 402 | Operating Systems | 6 | 4 | 0 | 4 | 8 | 60 | 40 | 60 | 40 | 200 |
| 3 | PGDAIDS 403 | SOFTWARE ENGINEERING | 4 | 4 | 0 | 0 | 4 | 60 | 40 | 0 | 0 | 100 |
| 4 | PGDAIDS 404 | Cloud Computing | 4 | 4 | 0 | 0 | 4 | 60 | 40 | 0 | 0 | 100 |
| 5 | PGDAIDS 405 | MACHINE LEARNING USING PYTHON LAB | 4 | 3 | 2 | 0 | 5 | 60 | 40 | 0 | 0 | 100 |
| | | **TOTAL** | **24** | **19** | **2** | **8** | **29** | **300** | **200** | **120** | **80** | **700** |

**Duration of the Programme:** The Duration of the Programme is Two years.

**(a) Faculty and Support Staff Requirement:** At present, there are three faculty members in the Department. The Department have all support staff for its the smooth functioning.

**(b) Instructional Delivery Mechanism:**

The instructional delivery mechanisms of the program should be designed to cater to the diverse needs of the learners, provide flexibility, and ensure effective learning outcomes. The program should also provide adequate support services such as academic counselling, technical support, and mentorship to ensure that learners receive the necessary guidance and assistance throughout the program.

As the University functions in the Open and Distance Learning mode, the programmes that we offer are designed to meet the varied requirements of the distant learner. Keeping this in view, the course material developed by the Department is learner friendly. Each course is divided into four to five blocks, which are further divided into units. Each Block consists of three to four units. This number has been determined taking into consideration the learning capabilities of our learners. The structure of the unit is in line with the guidelines laid down by the DEB-UGC, the apex regulatory body of Open and Distance Learning. The content is kept simple and lucid and follows the self-instructional pattern. Each lesson includes a number of self-assessment questions along with hint answers so that the students are able to track their progress as they proceed with the lesson. At the end of each unit, a list of other relevant books is also provided. Besides providing quality study

material to our learners, the Department, following the ODL pattern, has defined its programmes in the terms of credits. In the ODL system, one credit is equivalent to 30 study hours i.e. the study input required for completion of the programme. Normally the P.G.Diploma in AI & Data Science programme is a 86 credit programme. This comprises all learning activities ie., reading and comprehending the SLM, availing audio-visual aids to enhance knowledge, attending counselling sessions and preparing assignments. Thus, in the P.G.Diploma in AI & Data Science programme, a learner is expectedto put in 2160 study hours to complete the programme in two years' time.

## (v) Procedure for admission, curriculum transaction and evaluation:

### Admission Process :

Notification issued by the University in Regional and National Newspapers and in the official website. Admission process is online through the MPOnline Portal. Payment of fee through online (various options like net banking etc.). Submission of the printout of the application by the candidate to concern study center along with original documents for eligibility, date of birth etc., and along with fee paid receipt. After the Verification of applications- for fulfillment of eligibility criteria (marks cards) documents, fee paid details. Approval of the admission and issue of self-learning material (Study Materials) to the students.

### Contact Programmes :

The personal contact programme in every course shall extend over a period of 13 working days in each semester and is usually conducted at the beginning of the session. The students are expected to come prepared in the class in order to discuss their problems meaningfully. 75% attendance in the personal contact programme is mandatory.

**Eligibility:** 12th with Mathematics

**Fee Structure: P.G.Diploma in AI & Data Science**

Rs. 9000: Per Year

**Evaluation norms:** A learner will be evaluated on the basis of Assignments and term-end examination. Assignments carry 30% weightage whereas the term end examination carry 70% weightage.

**Evaluation system:**
- Students shall have a minimum of 50% of total marks of the University examinations in each Course. The overall passing minimum is 50% both in aggregate of Continuous Internal Assessment and External Examination in each Course.
- Every course shall have two components of assessment namely,
  - Continuous Internal Assessment "CIA": This assessment will be carried out throughout the

semester as per the Academic Schedule.

> End Semester Examination "ESE": This assessment will be carried out at the end of the Semester as per the Academic Schedule.

**Continuous Internal Assessment "CIA":**

- Continuous Internal Assessment for each Course shall be by means of Written Tests/ Assignments, and Class Tests for a total mark of 30.
- Continuous Internal Assessment for each Course shall be the responsibility of the concerned CourseFaculty.

- The valued answer papers/assignments shall be given to the students after the valuation is completed and they be asked to check and satisfy themselves about the marks they scored.
- All records in respect of Continuous Internal Assessments shall be in the safe custody of the PI for at least one year after the assessment.

**Theory course assessment weightages:**

The general guidelines for the assessment of Theory Courses, Department Electives and Non – Department Electives shall be done on a continuous basis as given in Table.

**Table : Weightage for Assessment**

| S.No. | Assessment | Weightage | Duration |
|-------|------------|-----------|----------|
| 1. | First Periodical Assessment | 10% | 2 periods |
| 2. | Second Periodical Assessment | 10% | 2 Periods |
| 3. | Practical/Project/ Lab | 5% | -- |
| 4. | End Semester Exam | 70% | 2 to 3 hours |

**Grading System**

Based on the student's performance in each semester, grade is awarded with a final letter grade at the end of the exam evaluation of each Course. The letter grades and the corresponding grade points are as follows.

**Table 3: Grading system**

| Range of Marks | Letter Grade | Grade Points | Remarks |
|----------------|--------------|--------------|---------|
| 90 – 100 | S | 10 | Outstanding |
| 80-89 | A | 09 | Excellent |
| 70-79 | B | 08 | Very Good |
| 60-69 | C | 07 | Good |
| 50-59 | D | 06 | Average |
| 40-49 | E | 05 | Pass |
| <40 | U | 00 | To Reappear for End-Semester Examination |

**GPA and CGPA**

Grade Point Average (GPA) is the ratio of the sum of the product of the number of credits $C_i$ of course "i "and the grade points $P_i$ earned for that course taken over all courses "i" registered and successfully completed by the student to the sum of $C_i$ for all "i". That is,

$$GPA = \frac{\sum_1^n C_i \ P_i}{\sum_1^n C_i}$$

Cumulative Grade Point Average (CGPA) will be calculated in a similar manner, in any semester, considering all the courses enrolled from the first semester onwards. The Grade card will not include the computation of GPA and CGPA for courses with letter grade "U" until those grades are converted to the regular grades.

**Grade Sheet**

Based on the performance, each student is awarded a final letter grade at the end of the semester in each course. The letter grades and corresponding grade points are given in Table 3. A student is considered to have completed a course successfully and earned credits if he/she secures a letter grade other than U in that course. After results are declared, grade sheet will be issued to each student which will contain the following details:

- Program and discipline for which the student has enrolled.
- Semester of registration.
- The course code, name of the course, category of course and the credits for each course registered in that semester
- The letter grade obtained in each course
- Semester Grade Point Average (GPA)
- The total number of credits  earned by the student up to the end of that semester in each of the course categories.
- The Cumulative Grade Point Average (CGPA) of all the courses taken from the first semester.
- Credits earned under Non – CGPA courses.
- Additional credits earned for  the respective UG degree or respective Degree with Minor specialization

**Class/Division**

Classification is based on as follows: CGPA ≥ 8.0: First

Class with Distinction

**6.5** ≤ CGPA <8.0: First Class

5.0 ≤ CGPA <6.5: Second Class

(i) Further, the award of 'First class with distinction' is subject to the candidate becoming eligible for the award of the degree, having passed the examination in all the courses in his/her first appearance with effect from II semester and within the minimum duration of the programme.

(ii) The award of 'First Class' is further subject to the candidate becoming eligible for the award of the degree, having passed the examination in all thecourses within 5 years.

(iii) The period of authorized break in study will not be counted for the purpose of the above classification.

**Eligibility For The Award of Degree**

A student will be declared to be eligible for the award of the P.G.Diploma in AI & Data Science degree ifhe/she has Registeredand successfully obtained credit for all the core courses:

➢ Successfully acquired the credits in the different categories as specified in the curriculum corresponding to the discipline of his/her study within the stipulated time:

➢ Has no dues to all sections of the institute including hostels and has no disciplinaryaction pending against him/her.

➢ The award of the degree must be recommended by the Academic Council and approved bythe Board of Management of the university.

**Re-View Of Answer Scripts / Single Valuation**

If any student feels aggrieved on the final outcome of the assessment in any course, the student shall apply to the Controller of Examinations, along with the prescribed fee, for the review of Tern End examination answer script, within the stipulated time after the announcement of the results of the examinations. The Controller of Examinations shall facilitate the review of the answer script jointly to be carried out by the student and the faculty detailed for this purpose. If any discrepancy is noticed during review the same shall be rectified and the originally awarded grade accordingly amended.

**(vi) Requirement of the laboratory support and library resources:**

**Internet Leased Line**

**Computer Lab:** The University has most modern high-tech Computer Lab with 24 hrs. Internet facility

for studying and R&D activities. The state-of-the-art facility features hardware & software that is geared to specific academic programmes.

**Research Lab:** University equipped with round the clock available Hi-tech research Lab. which includes latest configured systems with Hi-speed internet facility loaded with latest software for research purpose.

**Library:** The University library is the hub of knowledge with more than 105832 books, Online Journals/Magazines, Back Volumes:, Thesis & Dissertations:, News Papers: 12, Book Bank: 25850 are conveniently accessible for the students and staff of MPBOU. Library includes Main reading area, separate reading area and reference section.

The MPBOU system consists of a Central Library and Departmental Libraries which collectively support the teaching, research and extension programmes of the Institute. All students, faculty members and employees of the Institute are entitled to use the Library facilities enrolling membership.

**Internet Facilities:** One Gbps – Lease Line Link are available at the university. University is fully networked with a campus wide network interconnecting all departments. Campus is fully Wi-Fi with high Speed internet connection available round-d-clock.

**MS TEAMS Platform:** The University has acquired the Zoom platform license and has gone 100% virtual in terms of delivering the regular classes during the COVID lockdown. This has given enough experience for the faculty and expertise to handle the platform for online learning. More than 150 guest lecturers have been organised in the brief period of three weeks inviting industry experts. The MPBOU team is now digitally empowered to conduct OL classes on this virtual platform on a regular basis which shall make the learning process very effective.

**LMS:** The Institute is using MOODLE and Microsoft Teams for Online teaching andto conduct test and Assignments

**(Viii) Cost estimate of the Programme and the provisions:**

The P.G.Diploma in AI & Data Science in English has been prepared in-house. The internal faculty has made contribution through units. The Department has utilized the acumen and expertise of seasoned academicians in the development of the course material. The expenses incurred in outsourcing units is as follows:

Cost Estimates for Development of the Programme:

| Programme | Programme Development | Delivery | Total |
|---|---|---|---|
| M.Sc. Information Technology | 5,00000/- | 3,00000/- | 8,00000/- |

**(ix) Quality Assurance Mechanism and expected programme outcomes:**

Quality assurance mechanisms are important in ensuring that P.G.Diploma in AI & Data Science programs meet the desired standards and deliver the expected outcomes. The following are some of the quality assurance mechanisms that can be put in place for an P.G.Diploma in AI & Data Science program:

- Curriculum design and review: The curriculum of an P.G.Diploma in AI & Data Science program should be designed to meet the needs of the industry and reflect the latest developments and trends in the field. Regular reviews shouldbe conducted to ensure that the curriculum remains relevant and up-to-date.

- Faculty qualifications and training: Faculty members should have the necessary qualifications and experience to teach the courses in the program. They should also receive regular training to enhance their teaching skills and keep up with the latest developments in the field.

- Student assessment: A variety of assessment methods should be used to evaluate student learning and mastery of the course material. These assessments should be aligned with the program's learning outcomes.

- Student support: Adequate support should be provided to students, including academic advising, mentoring, and counseling services. The program should also provide access to resources such as a library, online databases, and study materials.

- Continuous improvement: The program should have a process in place for continuous improvement, which involves gathering feedback from students, alumni, and employers to identify areas of strength and weakness and make necessary adjustments.

The expected program outcomes of an P.G.Diploma in AI & Data Science program may include the following:

- Advanced knowledge and skills in IT: Graduates of an P.G.Diploma in AI & Data Science program should have advanced knowledge and skills in areas such as software development, network administration, cyber security, and data analytics.

- Critical thinking and problem-solving skills: Graduates should be able to apply critical thinking and problem-solving skills to analyze complex IT problems and develop effective solutions.

- Effective communication skills: Graduates should be able to communicate effectively with both technical and non-technical stakeholders, including colleagues, clients, and managers.

- Leadership and teamwork skills: Graduates should be able to work effectively in teams and demonstrate leadership skills in managing projects and teams.

- Ethical and professional conduct: Graduates should be aware of ethical and professional standards in the IT industry and demonstrate ethical and professional conduct in their work.

Overall, an P.G.Diploma in AI & Data Science program should aim to produce graduates who are well-prepared for careers in the IT industry and can make significant contributions to the field. Quality assurance mechanisms can help ensure that the program meets these goals and delivers the expected outcomes.

**P.G.DIPLOMA IN AI & DATA SCIENCE SEMESTER-I SYLLABUS**
**PGDAIDS103: Programming in C**

## UNIT 1: INTRODUCTORY CONCEPTS
Learning Objectives, Introduction, Algorithm, Conventions Used in Writing Algorithm, Method for Developing an Algorithm, Pseudocode, Flowchart, Symbols of Flowchart, Advantages and Limitations of Flowchart, Let Us Sum Up, Answers to Check Your Progress, Further Reading, Model Questions

## UNIT 2: ELEMENTS OF C PROGRAMMING
Learning Objectives, Introduction, C Character Set, Tokens, Identifiers, Reserved Words, Constants, Variables, Let Us Sum Up, Answers to Check Your Progress, Further Reading, Model Questions

## UNIT 3: VARIABLES AND DATA TYPES
Learning Objectives, Introduction, Basic Data Types in C, C Variables and their Declarations, Symbolic Constants, Let Us Sum Up, Answers to Check Your Progress, Further Reading, Model Questions

## UNIT 4: OPERATORS AND EXPRESSIONS
Learning Objectives, Introduction, Operators, Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increments and Decrement Operators, Conditional Operators, Bitwise Operators, Special Operators, Precedence and Associativity, Expressions, Type Conversion, Let Us Sum Up, Answers to Check Your Progress, Further Reading, Model Questions

## UNIT 5: PREPROCESSOR DIRECTIVES AND I/O FUNCTIONS
Learning Objectives, Introduction, Header Files, Formatted Input/Output Functions, Control Strings used in printf() and scanf() Functions, Escape Sequences, Unformatted Input/Output Functions, Let Us Sum Up, Answers to Check Your Progress, Further Reading, Model Questions

## UNIT 6: CONDITIONAL STATEMENTS
Learning Objectives, Introduction, Decision Control Statements, Conditional Branching Statement, if Statement, if-else Statement, Nested if-else Statement, switch Statement, break Statement, continue Statement, goto Statement, Conditional Operator Statement, Let Us Sum Up, Answers to Check Your Progress, Further Reading, Model Questions

## UNIT 7: LOOP CONTROL STRUCTURES
Learning Objectives, Introduction, Loop Control Statements, while Loop, do-while Loop, for Loop, Let Us Sum Up, Answers to Check Your Progress, Further Reading, Model Questions

## PGDAIDS203 :Basics of Data Science

# UNIT-1

Introduction, Toolboxes: Python, fundamental libraries for data Scientists,Integrated development environment (IDE). Data operations, Reading, selecting, filtering, manipulating, sorting, grouping, rearranging, ranking, and plotting.

# UNIT-2

Descriptive statistics, data preparation. Exploratory Data Analysis data summarization,data distribution, measuring asymmetry. Sample and estimated mean, variance and standard score. Statistical Inference frequency approach, variability of estimates,hypothesis testing using confidence intervals, using p-values

# UNIT-3

Supervised Learning: First step, learning curves, training-validation and test.
Learning models generalities, support vector machines, random forest.
Examples

# UNIT-4

Regression analysis, Regression: linear regression simple linear regression,multiple & Polynomial regression, Sparse model. Unsupervised learning,clustering, similarity and distances, quality measures of clustering, case study.

# UNIT-5

Network Analysis, Graphs, Social Networks, centrality, drawing centrality of Graphs, PageRank, Ego-Networks, community Detection.

## PGDAIDS204:Data Structure

### UNIT 1 - INTRODUCTION TO 'C' LANGUAGE

Introduction ,Objectives , Basic Concepts of C Language, Basic Constructs of Structured Programming, History of C Language, Advantages of C Language, Components of C Language, Structure of a C Program, A Sample C Language Program, Data Types, Primitive Data Types, Composite Data Types, Constants, Integer Constants ,Character Constants, Floating Point or Real Numbers, Enumeration Constant, String Constants, Logical Constants , Variables, Operators and Expressions, Arithmetic Operators, Increment and Decrement Operators, Logical Operators, Relational Operators, Conditional Operator, Assignment Operator, Bitwise Operators, Special Operators , Operators and Associativity, Type Modifiers, Type Definitions Using `Typedf`, Conditional Statements, `SWITCH` Statement, Control Program, Answers to 'Check Your Progress, Summary, Key Terms, Self-Assessment Questions and Exercises, Further Reading

### UNIT 2 ARRAYS, FUNCTIONS AND STRUCTURES, POINTERS

Introduction, Objectives, Arrays, Single-Dimensional Arrays , Multi-Dimensional Arrays , Two-dimensional Arrays, Three-dimensional Arrays, String, Function Declaration and Prototype , Function Call – Passing Arguments to a Function , Function Definition, Need of User Defined Functions , Scope and Lifetime Declaration of Variables , Return Values , Storage Classes , Command Line Arguments, Recursion in Functions , Implementation of Euclid's gcd Algorithm,Structure Initailization , Declaration: Assigning Values to Members, Processing a Structure Variable , Comparison of Structure Variables, Array of Structures, Structure Elements passing to Functions, Structure Passing to Functions, Structure within Structure, Structure Containing Arrays, Union , Structure Pointers , Pointers: Declaration and Initialization, Pointer Notation and Accessing

Variable, Arrays and Pointers , Pointer Expressions , Pointers and One Dimensional Arrays, Malloc Library Function and Calloc Library Function, Pointers and Multi-dimensional Arrays , Arrays of Pointers, Pointer to Pointers, Pointers and Functions , Function with a Variable number of Arguments, Answers to 'Check Your Progress', Summary,  Key Terms, Self-Assessment Questions and Exercises, Further Reading

## UNIT-3 DATA STRUCTURES
Introduction, Objectives, Data Structure, Primitive and Composite Data Types, Abstract Data Type, Algorithm Design, Program Analysis, Stacks and their Representation, Applications of Stacks , Simulating Recursive Function using Stack , Queues , Circular Queue , Deques , Priority Queue , Linked List , Static and Dynamic Memory Allocation, Static and Dynamic Variable, Linked Lists: Pointers , Singly Linked Lists. ,  Representation of Linked List, Implementation of Linked Lists , Reversing of Linked List , Concatenation of Linked List , Merging Linked List using Merge Sort , Applications of Linked List , Circular Linked List , Doubly Linked List , Generalized List , Answers to 'Check Your Progress' , Summary , Key Terms , Self-Assessment Questions and Exercises, Further Reading

## UNIT – 4 TREES AND GRAPHS
Introduction , Objectives, Trees: Basic Terminology , Binary Trees, Throrems Associated with Binary Trees, Tree Traversal, Implementation of Binary Trees , Deleting from a Binary Tree, Graph: Definition and Terminology, Representation of Graphs, Path Matrix, Traversal of Graph , Spanning Trees , Answers to 'Check Your Progress', Summary ,  Key Terms , Self-Assessment Questions and Exercises , Further Reading

## UNIT 5HASH TABLE, SEARCHING AND SORTING
Introduction, Objectives, Hash Table , Hashing Function ,  Terms Associated with Hash Tables Bucket Overflow, Handling Bucket Overflows , ISAM, Searching, Sorting , Answers to 'Check Your Progress', Summary, Key Terms, Self-Assessment Questions and Exercises, Further Reading

## P.G.DIPLOMA IN AI & DATA SCIENCE SEMESTER-IV SYLLABUS

### PGDAIDS402- Operating Systems

# Unit -1 : Introduction to Operating System
Objective ,Introduction to Operating System , Some Definitions , Goals 1.1.3 Generations ,Classification of Operating Systems ,Single User – Single Processing System , Batch Processing Systems , Multiprogramming Operating System , Time Sharing or Multitasking System ,Parallel or Multiprocessing Systems , Distributed Systems , Real Time Systems , Functions/Services of Operating Systems ,Summary , Answer to the Self Answering Exercises , Self Assessment Questions

## Unit- 2 : User Interface & Computing Environments
Objective ,Introduction , User Interfaces , Command Interpreter / Command User Interface (CUI), Graphical User Interfaces (GUI), Difference between CUI and GUI, Computing Environments, Traditional Computing, Client-Server Computing, Peer-to-Peer Computing , Web-based Computing, System Call , Summar , Answer to the Self Learning Exercises  Self Assesment Questions

## Unit-3 : Types of Operating Systems
Objective, Introduction, Evolution of Operating System, Types of Operating Systems, Batch Processing Operating System, Multiprogramming Operating System, Multitasking Operating System,  Time Sharing Operating System, Real Time Operating System, Multiprocessor Operating System, Distributed operating system, Special Operating System - Embedded Operating System - Mobile O.S. or Handheld O.S , Summary , Self Assessment Questions

## Unit - 4 : Process Management

Objective, Introduction, Introduction to Processes, Process State , Process Control Block, Context Switching, Process Creation & Termination, Basics of Inter-Process Communication - Shared Memory & Message Passing System, Basics of Communication in Client-Server System - Sockets - R.P.C. - R.M.I. , Summary, Self Assessment Questions

### Unit - 5 : Theards.

0Objective, Introduction, Threads, Processes Vs Threads, User-Level Threads, Kernel-Level Threads, Multi Threading Models, Thread Libraries ,Thread Issues, Thread Scheduling, Summary, Self Assessment Questions

### Unit - 6 : Process Scheduling : Basic Concept

Objective, Introduction, Type of Schedulers, CPU-I/O Burst Cycle , Scheduling Criteria , Scheduling Algorithms, First-Come First-Served(FCFS) Scheduling , Shortest Job First Scheduling, Operating system Examples , Linux Scheduling , Windows Scheduling , Summary , Self Assessment Questions

## Unit - 7 : Process Synchronization Structure of the Unit

Objective , Meaning of Synchronization, Need of Synchronization, Thread and Process Synchronization , Data Synchronization , File-Based Solutions, Race Condition, Race Condition Properties , Critical-Section Problem, Synchronization Hardware, Introduction to Semaphore & Monitor, Producer-Consumer Problem using Semaphores, What is Monitor? , Differences between Monitors and Semaphores , Summary , Self-Assessment Questions

### Unit - 8 : Deadlocks

Objective , Introduction , Necessary Conditions for Deadlocks , Prevention , Elimination of "Mutual Exclusion" Condition , Elimination of "Hold and Wait" Condition, Elimination of "No-preemption" Condition, Elimination of "Circular Wait" Condition, Deadlock Avoidance , Banker's Algorithm, Deadlock Detection 8.6Recovery from Deadlock , Recovery from Deadlock : Process Termination , Recovery from Deadlock : Resource Preemption , Summary, Self Assessment Question

### Unit - 9 : Memory Management

Objective, Introduction, Memory Hierarchy, Fragmentation, Paging, Shared Pages, Kernel Memory Alocation, Summary, Self Assessment Questions

### Unit - 10 : Introduction to Paging, Segmentation and Segmentation with Paging

Objective, IntroductioN, Segmentation, Segmentation with Paging, Basic H/W Support, Structure of Page Table, Hierarchical Paging, Hashed paging, Inverted Page Tables, Summary, Self Assessment Questions

### Unit - 11 : Virtual Memory Management

Objective, Introduction, Pre paging and Demand Paging, Copy-on-write, Page replacement basic , Page replacement policies, Thrashing cause, Summary, Self Assessment Questions

### Unit - 12 : File Management System

Objective, Introduction, File Attributes, File Operations, File Types, File Structure, Internal File Structures, Accessing Method - Sequential access, Direct access, Directory Structure, File Access and Access Control, Summary, Self Assessment Questions

### Unit - 13 : I/O

Objective,1Introduction , Overview I/O Hardware, Polling, Interrupts, Direct Memory Access, Application I/O Interface , Blocked Character Device, Blocking & Non Blocking Input Output , Kernel I/O Sub System , Input Output scheduling , Buffering, Caching, Spooling and Device Reservation , Error handling, I/O Protection, Kernel Data Structure , Summary, Self Assessment Questions

### Unit - 14 : System Protection

Objective , Introduction , Goals of Protection , Principles of Protection , Domain of Protection , Domain Structure , Methods for enforcement of protection mechanisms , Access Right , Access Matrix , Implementation of Access Matrices , Comparison of access list and capability list , Revocation of Access Rights , Summary , Self Assessment Questions

**Unit - 15 : System Security**

Objective , Introduction , Need for Security, Principles of Security , Authentication , Passwords ,  Artifact based Authentication,  Biometrics Techniques, Encryption,  Program & System threats, Virus , Worms , Trojan horse , Trap Doors , Logic Bomb , Port Scanning , Stack & Buffer Overflow, Denial of services , Computer Security Classification, Summary, Self Assessment Questions

## PGDAIDS403: SOFTWARE ENGINEERING

### Unit-I

Software Engineering Fundamentals: Software Engineering, Software Product: Software development paradigms, software Characteristics and Application. Software Development life cycle, water fall model, Prototyping, Incremental & Spiral model, 4th Generation Techniques. Project Management: Concepts, Software Process and Project Metrics; Software Measurements; Software Projects Planning: Objectives, Scope and Resources. Empirical Estimation Models: COCOMO Model, Software Equation, Project Scheduling and Tracking.

### Unit-II

Software Requirement System(SRS) and Analysis: System Engineering, Product Engineering: Characteristics of a Good SRS, Requirement analysis, Principal, Software prototyping. Analysis modelling: data modelling, mechanics for structured analysis, system analysis tools and techniques, DFD, ER- Diagrams. Data Dictionary (DD), System Design: Design concept and principles and its elements, effective modular design, Cohesion & Coupling, Feature of modern graphics interface (GUI). Design Methods: data design, interface design guidelines, procedural design.

### Unit-III

Software Quality Assurance(SQA): Quality and factors, Quality Assurance, Software Quality Metrics, Process and Product Quality, Capability Maturity Model (CMM). Software Quality Assurance(SQA), Need for SQA, SQA Activities, Building blocks of SQA, SQA Planning & Standards, Software Reliability, Reliability Measures.  Introduction to Software Testing: Need of software(s/w) testing, Error, fault and failure. s/w Testing fundamentals, Testing objectives, test information flows, Testing lifecycle, Test Cases.

### Unit-IV

Levels of Testing**:** Unit Testing, Integration Testing, System Testing,  Acceptance Testing, Alpha testing & Beta testing, Static vs. Dynamic testing, Manual vs. Automatic testing, Different types of Testing: Installation Testing, Usability testing, Regression testing, Performance testing, Load testing, stress testing, Security testing, Static & Dynamic testing, Static testing techniques, Review types : Informal Review, Technical or peer review, Walkthrough, Inspection, static analysis, Review meeting and  reporting , Review guidelines & Review checklist, Data flow analysis, Control flow  analysis, Cyclometric  Analysis, Dynamic testing – need & Advantages

### Unit-V

Black Box & White Box Testing (Test Case Design Techniques):Functional Testing (Black Box), Equivalence partitioning, BVA, Decision table based testing, Cause-Effect graphing, Syntax testing (Concept & Test case generation only), Structural Testing (White Box), Coverage testing, Statement coverage, Branch & decision coverage, Path coverage, Validation testing Activities, Low level testing, High level testing, Black box Vs. White Box

**References:**

1. Software Engineering – A Practitioners Approach Roger S. Pressman, Mcgraw Hill, International Education.
2. An Integrated Approach To software Engineering, Pankaj Jolote, ,Narosa
3. Software Engineering – A Programming Approach, D. Belie I. Moray, J. Rough, PHI.
4. Software Testing Techniques, Barrios Bier, Van N Ostrand Reinhold.
5. Software Engineering Concepts-Richard Fairley, CDAC. Tata McGraw-Hill Series.

**PGDAIDS404 :Cloud Computing**

# Unit 1: Infrastructure as a Service& Platform as a Service
Learning Objective, Cloud Service Models, Infrastructure as a Service, Platform as a Service, Case Studies, Let's Sum up

## Unit 2:Software as a Service and Database as a Service
Learning Objectives, Software as a Service (SaaS),  Database as a Service (DBaaS), Let's Sum up

## Unit 3:Security as a Service
Learning Objectives, Introduction to Security as a Service, Cloud Security Risk analysis, SECaaS Categories, Benefits Of Security As A Service, Evaluation of Cloud Security Issues, Cloud Security Standards, Let's sum up

## Unit 4:Specialized Cloud Services
Learning Objectives, Recovery as a Service (RaaS), Identity as a Service (IDaaS), Storage as a Service, Communication as a Service (CaaS), Let's sum up