



MGM UNIVERSITY, CHHATRAPATI SAMBAJINAGAR

ACADEMIC SECTION

NOTIFICATION

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17th August 2023

Enclosed Format of Curriculum Booklet




Registrar 17/8/23
Registrar
MGM University
Aurangabad

To,

All Deans and Principals / Directors / HoD's

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1. PS of Hon'ble Chancellor - For kind information please,
2. PS of Hon'ble Vice-Chancellor
3. The Controller of Examinations
4. The ERP section
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6. The Deputy Registrar (Academics)



MGM University

Chhatrapati Sambhajinagar

Name of Faculty – Engineering & Technology

Name of Institute – Institute of Information and Communication Technology

Name of Programme – B. Tech. AIML with Multidisciplinary Minor

CURRICULUM BOOKLET

(With effect from Academic year 2023-24)

MGM University
Chhatrapati Sambhajinagar

MGMUNIVERSITY

Published by –

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MGM University**

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MGMUNIVERSITY

MGM University

Vision

- To ensure sustainable human development which encourages self-reliant and self-content society.
- To promote activities related to community services, social welfare and also Indian heritage and culture.
- To inculcate the culture of non-violence and truthfulness through vipassanna meditation and Gandhian Philosophy.
- To develop the culture of simple living and high thinking

Mission

- To impart state of art education and technical expertise to students and give necessary training to teachers to create a self-reliant society for future.
- To encourage students to participate in Indian and International activities in sports, literature, etc. so that future generation becomes base for free and liberal society
- To educate students in areas like Management, Finance, Human relations to inculcate philosophy of simple living and high thinking value of simple economic society.
- To inculcate a culture of non-violence and truthfulness through Vipassana.

To sustain activities of Indian culture (viz. classical dance, music and fine arts) through establishing institutes like Mahagami, Naturopathy, etc.

विद्यापीठ गीत

अत्त दिप भव भव प्रदिप भव,
 स्वरूप रूप भव हो
 ज्ञान सब्ब विज्ञान सब्ब भव,
 सब्ब दिप भव हो
 अत्ताहि अत्त नो नाथो,
 अत्ताहि अत्त नो गति
 अत्त मार्गपर अप्रमादसे है तुझे चलना
 सब्ब का कल्याण हो,
 वो कार्यकुशल करना
 सब्ब का उत्तम मंगल, पथप्रदर्शक हो
 अत्त दिप भव भव प्रदिप भव,
 स्वरूप रूप भव हो
 ज्ञान सब्ब विज्ञान सब्ब भव,
 सब्ब दिप भव हो
 बुद्धमं शरनं गच्छामि :
 धम्मं शरनं गच्छामि :
 संघं शरनं गच्छामि :

Institute of Information and Communication Technology (IICT) at a Glance

The Institute of Information and Communication Technology (IICT) offers emerging courses in Information Technology, with a focus on Internet of Things (IoT), Blockchain, and Big Data Analytics (BDA). Additionally, it provides undergraduate degrees in Artificial Intelligence & Machine Learning (B.Tech. AI and ML) and Data Science (B.Tech. Data Science). IICT also offers B. Tech CSE(AI) in collaboration with IBM. Furthermore, the department offers Master of Technology Degrees in Data Science (M.Tech. Data Science) and AI & ML (M.Tech. AI and ML) and UG Diploma in Cyber Security and Digital Forensics. Moreover, IICT offers a PhD program in IT.

Vision

IICT shall be a center of excellence fostering innovation, entrepreneurship, and technological advancement with social and global perspectives. It will develop skilled professionals and contribute to industry, research, and interdisciplinary growth.

Mission

- Empower students with human values, ethical conduct, and environmental responsibility.
- Foster interdisciplinary technocrats contributing to sustainable industrial growth.
- Promote expertise in emergent technologies through research, innovation, and industry collaboration to solve real-world challenges.
- Encourage entrepreneurship and leadership, preparing students for future challenges.

Programs offered at IICT

| Undergraduate Programmes | Postgraduate Programmes | UG Diploma | PhD Programmes |
|---|--------------------------------|--------------------------------------|-----------------------|
| B.Tech. in Information Technology | M.Tech. Data Science | Cyber Security and Digital Forensics | PhD in IT |
| B.Tech. in Artificial Intelligence and Machine Learning | M.Tech. AI and ML | | |
| B.Tech. in Data Science | | | |
| B. Tech CSE(AI) | | | |

MGMUNIVERSITY

Name of Program – B. Tech. AIML**Duration – Four Years****Eligibility** –Passed HSC or its equivalent examination from science stream and obtained at least 45% marks (at least 40% marks, in case of Backward class categories belonging to Maharashtra State only) and the candidate should have appeared and secured non zero score in MGMU-CET 2024/MHT-CET 2024/PERA-CET 2024/JEE Mains 2024.**1. Maharashtra State Candidate**

(i) The Candidate should be an Indian National and having domicile of Maharashtra state and/or born in Maharashtra state.

(ii) Passed HSC or its equivalent examination with Physics and Mathematics as compulsory subjects along with one of the Chemistry or Biotechnology or Biology or Technical Vocational subject or Computer Science or Information Technology or Informatics Practices or Agriculture or Engineering Graphics or Business Studies, and obtained at least 45% marks (at least 40% marks, in case of Backward class categories and Persons with Disability candidates belonging to Maharashtra State only) in the above subjects taken together and the candidate should have appeared in MGMU-CET 2024/ MHT-CET 2024/ PERA CET 2024/ JEE (Main) Paper-I 2024 and should obtain non zero score in MGMU-CET 2024/ MHT-CET 2024/ PERA CET 2024/ JEE (Main) Paper-I 2024.. However, preference shall be given to the candidate obtaining non-zero positive score in MGMU-CET 2024 over the candidates who obtained non-zero score in MHT-CET 2024/ PERA CET 2024.

OR

(ii)Passed Diploma in Engineering and Technology and obtained at least 45% marks (at least 40% marks, in case of Backward class categories and Persons with Disability candidates belonging to Maharashtra State only).

2. All India Candidates

(i) The Candidate should be an Indian National.

(ii) Passed HSC or its equivalent examination with Physics and Mathematics as compulsory subjects along with one of the Chemistry or Biotechnology or Biology or Technical Vocational subject or Computer Science or Information Technology or Informatics Practices or Agriculture or Engineering Graphics or Business Studies , and obtained at least 45% marks (at least 40% marks, in case of Backward class categories and Persons with Disability candidates belonging to Maharashtra State only) in the above subjects taken together and candidate should have appeared in MGMU-CET 2024/ MHT-CET 2024/ PERA CET 2024/ JEE (Main) Paper-I 2024 and should obtain non-zero score in MGMU-CET 2024/ MHT-CET 2024/ PERA CET 2024/ JEE (Main) Paper-I 2024. However, preference shall be given to the candidate obtaining non-zero positive score in JEE Mains Paper-I over the candidates who obtained non-zero score in MGMU-CET 2024/ MHT-CET 2024/ PERA CET 2024.

OR

(ii) Passed Diploma in Engineering and Technology and obtained at least 45% marks (at least 40% marks, in case of Backward class categories and Persons with Disability candidates belonging to Maharashtra State only)

Name of Faculty: Faculty of Engineering and Technology

Name of the Department : Institute of Information and Communication Technology (IICT)

Name of the Programme: B.Tech. in Artificial Intelligence and Machine Learning with Multidisciplinary Minor

Programme Type (UG/PG): UG

Duration: 4 Years

| First Year - Semester I (Group A) | | | | | | | | | | | | |
|-----------------------------------|---|--|------------------|---------------|------------------------------|----|---------------------------|----------|-------|-------------------------|----------|-------|
| Course Category | Course Code | Course Title | Nature of Course | No of Credits | Teaching (Contact hrs/ week) | | Evaluation Scheme (Marks) | | | Minimum Passing (Marks) | | |
| | | | | | L | P | Internal | External | Total | Internal | External | Total |
| BSC | APS21BSL101 | Single and Multivariable Calculus | Lecture | 4 | 4 | - | 60 | 40 | 100 | - | 16 | 40 |
| BSC | APS21BSL102 | Engineering Physics | Lecture | 3 | 3 | - | 60 | 40 | 100 | - | 16 | 40 |
| ESC | APS21ESL101 | Python Programming | Lecture | 2 | 2 | - | 60 | 40 | 100 | - | 16 | 40 |
| ESC | APS21ESL102 | Engineering Graphics | Lecture | 2 | 2 | - | 60 | 40 | 100 | - | 16 | 40 |
| AEC | MGM54AEL101 | Communicative English | Lecture | 1 | 1 | - | 30 | 20 | 50 | - | 8 | 20 |
| VSEC | APS21VSP101 | Engineering Exploration | Practical | 2 | - | 4 | 60 | 40 | 100 | - | 16 | 40 |
| BSC | APS21BSP101 | Engineering Physics Lab | Practical | 1 | - | 2 | 30 | 20 | 50 | - | 8 | 20 |
| ESC | APS21ESP101 | Python Programming Lab | Practical | 1 | - | 2 | 30 | 20 | 50 | - | 8 | 20 |
| ESC | APS21ESP102 | Engineering Graphics Studio | Practical | 2 | - | 4 | 30 | 20 | 50 | - | 8 | 20 |
| ESC | APS21ESP103 | Recent Trends in Integrated Technology | Practical | 1 | - | 2 | 30 | 20 | 50 | - | 8 | 20 |
| AEC | MGM54AEP101 | Communicative English Lab | Practical | 1 | - | 2 | 30 | 20 | 50 | - | 8 | 20 |
| CCA | MGM82C CP101 MGM82C CP102 MGM82C CP103 | NCC /Yoga / Sports | Practical | 2 | - | 4 | 50 | - | 50 | 20 | - | 20 |
| TOTAL | | | | 22 | 12 | 20 | 530 | 320 | 850 | - | - | - |

| First Year - Semester II (Group A) | | | | | | | | | | | | |
|------------------------------------|---|---|------------------|---------------|------------------------------|----|---------------------------|----------|-------|-------------------------|----------|-------|
| Course Category | Course Code | Course Title | Nature of Course | No of Credits | Teaching (Contact hrs/ week) | | Evaluation Scheme (Marks) | | | Minimum Passing (Marks) | | |
| | | | | | L | P | Internal | External | Total | Internal | External | Total |
| BSC | APS21BSL103 | Linear Algebra and Differential Equations | Theory | 4 | 4 | - | 60 | 40 | 100 | - | 16 | 40 |
| BSC | APS21BSL104 | Engineering Chemistry | Theory | 3 | 3 | - | 60 | 40 | 100 | - | 16 | 40 |
| ESC | APS21ESL103 | Engineering Mechanics | Theory | 2 | 2 | - | 60 | 40 | 100 | - | 16 | 40 |
| ESC | APS21ESL104 | Building Programming logic in C | Theory | 1 | 1 | - | 30 | 20 | 50 | - | 8 | 20 |
| PCC | APS21PCL 101 | Basics of Electrical and Electronics Engineering | Theory | 2 | 2 | - | 60 | 40 | 100 | - | 16 | 40 |
| IKS | APS21IKL101 | Indian Knowledge System | Theory | 2 | 2 | - | 60 | 40 | 100 | - | 16 | 40 |
| VSEC | APS21VSP102 | Workshop Practices | Practical | 2 | - | 4 | 60 | 40 | 100 | - | 16 | 40 |
| BSC | APS21BSP102 | Engineering Chemistry Lab | Practical | 1 | - | 2 | 30 | 20 | 50 | - | 8 | 20 |
| ESC | APS21ESP104 | Engineering Mechanics Lab | Practical | 1 | - | 2 | 30 | 20 | 50 | - | 8 | 20 |
| ESC | APS21ESP105 | Building Programming logic in C Lab | Practical | 1 | - | 2 | 30 | 20 | 50 | - | 8 | 20 |
| PCC | APS21PCP 101 | Electrical and Electronics Technology Lab | Practical | 1 | - | 2 | 30 | 20 | 50 | - | 8 | 20 |
| CCA | MGM82CCP104 MGM73CCP105 MGM73CCP106 MGM85CCP107 MGM82CCP201 | NSS/ Fine Art/ Visual Art Cultural Activities Health and Wellness | Practical | 2 | - | 4 | 50 | - | 50 | 20 | - | 20 |
| TOTAL | | | | 22 | 14 | 16 | 560 | 340 | 900 | - | - | - |

| First Year - Semester I (Group B) | | | | | | | | | | | | |
|-----------------------------------|---|--|------------------|---------------|------------------------------|----|---------------------------|----------|-------|-------------------------|----------|-------|
| Course Category | Course Code | Course Title | Nature of Course | No of Credits | Teaching (Contact hrs/ week) | | Evaluation Scheme (Marks) | | | Minimum Passing (Marks) | | |
| | | | | | L | P | Internal | External | Total | Internal | External | Total |
| BSC | APS21BSL101 | Single and Multivariable Calculus | Theory | 4 | 4 | - | 60 | 40 | 100 | - | 16 | 40 |
| BSC | APS21BSL104 | Engineering Chemistry | Theory | 3 | 3 | - | 60 | 40 | 100 | - | 16 | 40 |
| ESC | APS21ESL101 | Python Programming | Theory | 2 | 2 | - | 60 | 40 | 100 | - | 16 | 40 |
| ESC | APS21ESL103 | Engineering Mechanics | Theory | 2 | 2 | - | 60 | 40 | 100 | - | 16 | 40 |
| AEC | MGM54AEL101 | Communicative English | Theory | 1 | 1 | - | 30 | 20 | 50 | - | 8 | 20 |
| PCC | APS21PCL101 | Basics of Electrical and Electronics Engineering | Theory | 2 | 2 | - | 60 | 40 | 100 | - | 16 | 40 |
| VSEC | APS21VSP102 | Workshop Practices | Practical | 2 | - | 4 | 60 | 40 | 100 | - | 16 | 40 |
| BSC | APS21BSP102 | Engineering Chemistry Lab | Practical | 1 | - | 2 | 30 | 20 | 50 | - | 8 | 20 |
| ESC | APS21ESP101 | Python Programming Lab | Practical | 1 | - | 2 | 30 | 20 | 50 | - | 8 | 20 |
| ESC | APS21ESP104 | Engineering Mechanics Lab | Practical | 1 | - | 2 | 30 | 20 | 50 | - | 8 | 20 |
| AEC | MGM54AEP101 | Communicative English Lab | Practical | 1 | - | 2 | 30 | 20 | 50 | - | 8 | 20 |
| PCC | APS21PCP101 | Electrical and Electronics Technology Lab | Practical | 1 | - | 2 | 30 | 20 | 50 | - | 8 | 20 |
| CCA | MGM82CCP101 MGM82CCP102 MGM82CCP103 | NCC / Yoga / Sports | Practical | 2 | - | 4 | 50 | - | 50 | 20 | - | 20 |
| TOTAL | | | | 23 | 14 | 18 | 590 | 360 | 950 | - | - | - |

| First Year - Semester II (Group B) | | | | | | | | | | | | |
|------------------------------------|---|---|------------------|---------------|------------------------------|----|---------------------------|----------|-------|-------------------------|----------|-------|
| Course Category | Course Code | Course Title | Nature of Course | No of Credits | Teaching (Contact hrs/ week) | | Evaluation Scheme (Marks) | | | Minimum Passing (Marks) | | |
| | | | | | L | P | Internal | External | Total | Internal | External | Total |
| BSC | APS21BSL103 | Linear Algebra and Differential Equations | Theory | 4 | 4 | - | 60 | 40 | 100 | - | 16 | 40 |
| BSC | APS21BSL102 | Engineering Physics | Theory | 3 | 3 | - | 60 | 40 | 100 | - | 16 | 40 |
| ESC | APS21ESL102 | Engineering Graphics | Theory | 2 | 2 | - | 60 | 40 | 100 | - | 16 | 40 |
| IKS | APS21IKL101 | Indian Knowledge System | Theory | 2 | 2 | - | 60 | 40 | 100 | - | 16 | 40 |
| ESC | APS21ESL104 | Building Programming logic in C | Theory | 1 | 1 | - | 30 | 20 | 50 | - | 8 | 20 |
| VSEC | APS21VSP101 | Engineering Exploration | Practical | 2 | - | 4 | 60 | 40 | 100 | - | 16 | 40 |
| BSC | APS21BSP101 | Engineering Physics Lab | Practical | 1 | - | 2 | 30 | 20 | 50 | - | 8 | 20 |
| ESC | APS21ESP102 | Engineering Graphics Studio | Practical | 2 | - | 4 | 30 | 20 | 50 | - | 8 | 20 |
| ESC | APS21ESP105 | Building Programming logic in C Lab | Practical | 1 | - | 2 | 30 | 20 | 50 | - | 8 | 20 |
| ESC | APS21ESP103 | Recent Trends in Integrated Technology | Practical | 1 | - | 2 | 30 | 20 | 50 | - | 8 | 20 |
| CCA | MGM82CCP104 MGM73CCP105 MGM73CCP106 MGM85CCP107 MGM82CCP201 | NSS/ Fine Art/ Visual Art Cultural Activities Health and Wellness | Practical | 2 | - | 4 | 50 | - | 50 | 20 | - | 20 |
| TOTAL | | | | 21 | 12 | 18 | 500 | 300 | 800 | - | - | - |

(Semester III)

| Course Category | Course Code | Course Title | Nature of Course | No. of Credits | Teaching Contacts Hrs/week | | Evaluation Scheme (Marks) | | | Minimum Passing (Marks) | | |
|-----------------|-------------|---|------------------|----------------|----------------------------|----------|---------------------------|------------|------------|-------------------------|----------|-------|
| | | | | | L | P | Internal | External | Total | Internal | External | Total |
| PCC | ITY23PCL201 | Discrete Structures and Applications | Lecture | 2 | 2 | - | 60 | 40 | 100 | - | 16 | 40 |
| PCC | ITY23PCL202 | Data structures | Lecture | 2 | 2 | - | 60 | 40 | 100 | - | 16 | 40 |
| PCC | ITY23PCL203 | Object Oriented Programming | Lecture | 2 | 2 | - | 60 | 40 | 100 | - | 16 | 40 |
| PCC | ITY23PCL204 | Network Communications and Computing | Lecture | 2 | 2 | | 60 | 40 | 100 | - | 16 | 40 |
| PCC | ITY23PCP202 | Data structures Lab | Practical | 1 | - | 2 | 30 | 20 | 50 | - | 8 | 20 |
| PCC | ITY23PCP203 | Object Oriented Programming Lab | Practical | 1 | - | 2 | 30 | 20 | 50 | - | 8 | 20 |
| MDM | | Refer Course no.1 of selected MDM from Appendix A | Lecture | 2 | 2 | - | 60 | 40 | 100 | - | 16 | 40 |
| OE1 | | Refer MGMU Basket | Lecture | 2 | 2 | - | 30 | 20 | 50 | - | 8 | 20 |
| OE2 | | Refer MGMU Basket | Lecture | 2 | 2 | | 30 | 20 | 50 | | 8 | 20 |
| FP | ITY23FPJ201 | Web Technology | Project | 2 | | 4 | 50 | - | 50 | 20 | - | 20 |
| EEMC | ITY23HSL201 | Business Management and Financial Accounting | Lecture | 2 | 2 | - | 60 | 40 | 100 | - | 16 | 40 |
| VEC | MGM56VEL102 | Constitution of India | Lecture | 2 | 2 | - | 30 | 20 | 50 | - | 8 | 20 |
| | | TOTAL | | 22 | 18 | 8 | 560 | 340 | 900 | | | |

Note:

Nature of Course : L- Lecture, P-Practical, S-Seminar, J-Project, I-Internship, D-Dissertation,

Course Category: PC-Program Core, PE-Program Elective, MDM-Minor, OE- Open electives, VSC-Vocational skill course, SEC-Skill Enhancement course, AEC-Ability Enhancement course, IKS-Indian Knowledge system, VEC-Value Education course, OJT-On Job Training / Internship / Apprenticeship, FP-Field project, CEP-Community engagement and service, CC-Co – curricular course, RM-Research methodology, RP-Research project.

| (Semester IV) | | | | | | | | | | | | |
|-----------------|-------------|---|------------------|-----------|-----------------|----------|---------------------------|------------|------------|-------------------------|----------|-------|
| Course Category | Course Code | Course Title | Nature of Course | Credit | Teaching Scheme | | Evaluation Scheme (Marks) | | | Minimum Passing (Marks) | | |
| | | | | | L | P | Internal | External | Total | Internal | External | Total |
| PCC | ITY23PCL251 | Statistics | Lecture | 2 | 2 | - | 60 | 40 | 100 | - | 16 | 40 |
| PCC | ITY23PCL252 | Programming in JAVA | Lecture | 2 | 2 | | 60 | 40 | 100 | - | 16 | 40 |
| PCC | ITY23PCL253 | Digital Logic Design | Lecture | 2 | 2 | - | 60 | 40 | 100 | - | 16 | 40 |
| PCC | ITY23PCL254 | Digital Image Processing | Lecture | 2 | 2 | - | 60 | 40 | 100 | - | 16 | 40 |
| PCC | ITY23PCP252 | Programming in JAVA– Lab | Practical | 1 | - | 2 | 30 | 20 | 50 | - | 8 | 20 |
| PCC | ITY23PCP254 | Digital Image Processing - Lab | Practical | 1 | - | 2 | 30 | 20 | 50 | - | 8 | 20 |
| MDM | | Course no.2 of selected MDM from Appendix A | Lecture | 2 | 2 | - | 60 | 40 | 100 | - | 16 | 40 |
| OE3 | | Refer MGMU Basket | Lecture | 2 | 2 | - | 30 | 20 | 50 | - | 8 | 20 |
| VSEC | ITY23VSP251 | Advanced Python | Practical | 2 | - | 4 | 30 | 20 | 50 | - | 8 | 20 |
| EEMC | ITY23HSL252 | Entrepreneurship Development | Lecture | 2 | 2 | - | 60 | 40 | 100 | - | 16 | 40 |
| VEC | MGM21VEL101 | Environmental Studies | Lecture | 2 | 2 | - | 30 | 20 | 50 | - | 8 | 20 |
| AEC | | Refer MGMU Basket | Lecture | 2 | 2 | - | 30 | 20 | 50 | - | 8 | 20 |
| | | TOTAL | | 22 | 18 | 8 | 540 | 360 | 900 | | | |

Note:

Nature of Course : L- Lecture, P-Practical, S-Seminar, J-Project, I-Internship, D-Dissertation,

Course Category: PC-Program Core, PE-Program Elective, MDM-Minor, OE- Open electives, VSC-Vocational skill course, SEC-Skill Enhancement course, AEC-Ability Enhancement course, IKS-Indian Knowledge system, VEC-Value Education course, OJT-On Job Training / Internship / Apprenticeship, FP-Field project, CEP-Community engagement and service, CC-Co – curricular course, RM-Research methodology, RP-Research project.

| Semester V | | | | | | | | | | | | |
|-----------------------------|-------------|--|------------------|-----------|-----------------|----------|---------------------------|------------|------------|-------------------------|----------|-------|
| Course Category | Course Code | Course Title | Nature of Course | Credit | Teaching Scheme | | Evaluation Scheme (Marks) | | | Minimum Passing (Marks) | | |
| | | | | | L | P | Internal | External | Total | Internal | External | Total |
| PCC | ITY23PCL301 | Design and Analysis of Algorithms | Lecture | 3 | 3 | - | 60 | 40 | 100 | - | 16 | 40 |
| PCC | AIM23PCL301 | Machine Learning and Applications | Lecture | 2 | 2 | - | 60 | 40 | 100 | - | 16 | 40 |
| PCC | ITY23PCL303 | Database Management Systems | Lecture | 2 | 2 | - | 60 | 40 | 100 | - | 16 | 40 |
| PCC | AIM23PCL302 | Artificial Intelligence Applications | Lecture | 2 | 2 | - | 60 | 40 | 100 | - | 16 | 40 |
| PCC | ITY23PCP301 | Design and Analysis of Algorithms – Lab | Practical | 1 | - | 2 | 30 | 20 | 50 | - | 8 | 20 |
| PCC | AIM23PCP301 | Machine Learning and Applications Lab | Practical | 1 | - | 2 | 30 | 20 | 50 | - | 8 | 20 |
| PCC | ITY23PCP303 | Database Management Systems– Lab | Practical | 1 | - | 2 | 30 | 20 | 50 | - | 8 | 20 |
| Program Elective - I | | | | | | | | | | | | |
| PEC | ITY23PEL302 | Microprocessor, Microcontroller and IoT | Lecture | 3 | 3 | - | 60 | 40 | 100 | - | 16 | 40 |
| PEC | AIM23PEL301 | Expert Systems | Lecture | | | | | | | | | |
| PEC | AIM23PEL302 | Mathematical Foundation for Cyber Security | Lecture | | | | | | | | | |
| PEC | ITY23PEP302 | Microprocessor, Microcontroller and IoT Lab | Practical | 1 | - | 2 | 30 | 20 | 50 | - | 8 | 20 |
| PEC | AIM23PEP301 | Expert Systems Lab | Practical | | | | | | | | | |
| PEC | AIM23PEP302 | Mathematical Foundation for Cyber Security Lab | Practical | | | | | | | | | |
| MDM | | Course no.3 of selected MDM from Appendix A | Lecture | 4 | 4 | - | 60 | 40 | 100 | - | 16 | 40 |
| OE4 | | Refer MGMU Basket | Lecture | 2 | 2 | - | 30 | 20 | 50 | - | 8 | 20 |
| | | TOTAL | | 22 | 18 | 8 | 510 | 340 | 850 | | | |

Nature of Course : L- Lecture, P-Practical, S-Seminar, J-Project, I-Internship, D-Dissertation,

Course Category: PC-Program Core, PE-Program Elective, MDM-Minor, OE- Open electives, VSC-Vocational skill course, SEC-Skill Enhancement course, AEC-Ability Enhancement course, IKS-Indian Knowledge system, VEC-Value Education course, OJT-On Job Training / Internship / Apprenticeship, FP-Field project, CEP-Community engagement and service, CC-Co – curricular course, RM-Research methodology, RP-Research project.

| Semester VI | | | | | | | | | | | | |
|-------------------------------|-------------|---|------------------|-----------|-----------------|-----------|---------------------------|------------|------------|-------------------------|----------|-------|
| Course Category | Course Code | Course Title | Nature of Course | Credit | Teaching Scheme | | Evaluation Scheme (Marks) | | | Minimum Passing (Marks) | | |
| | | | | | L | P | Internal | External | Total | Internal | External | Total |
| PCC | AIM23PCL351 | Convolution Neural Networks | Lecture | 3 | 3 | - | 60 | 40 | 100 | - | 16 | 40 |
| PCC | DSC23PCL352 | Computer Vision and Pattern Recognition | Lecture | 3 | 3 | - | 60 | 40 | 100 | - | 16 | 40 |
| PCC | AIM23PCL352 | Data Visualization | Lecture | 2 | 2 | - | 60 | 40 | 100 | - | 16 | 40 |
| PCC | AIM23PCP351 | Convolutional Neural Networks - Lab | Practical | 1 | - | 2 | 30 | 20 | 50 | - | 8 | 20 |
| PCC | AIM23PCP352 | Data Visualization Lab | Practical | 1 | - | 2 | 30 | 20 | 50 | - | 8 | 20 |
| Program Elective - II | | | | | | | | | | | | |
| PEC | ITY23PEL352 | IoT Communications | Lecture | 3 | 3 | - | 60 | 40 | 100 | - | 16 | 40 |
| | AIM23PEL351 | Knowledge Engineering | | | | | | | | | | |
| | AIM23PEL352 | Cryptography and Data Compression | | | | | | | | | | |
| PEC | ITY23PEP352 | IoT Communications Lab | Practical | 1 | - | 2 | 30 | 20 | 50 | - | 8 | 20 |
| | AIM23PEP351 | Knowledge Engineering Lab | | | | | | | | | | |
| | AIM23PEP352 | Cryptography and Data Compression Lab | | | | | | | | | | |
| Program Elective - III | | | | | | | | | | | | |
| PEC | ITY23PEL355 | IoT Networking | Lecture | 3 | 3 | - | 60 | 40 | 100 | - | 16 | 40 |
| | AIM23PEL353 | Speech Recognition | | | | | | | | | | |
| | AIM23PEL354 | Steganography and Digital Watermarking | | | | | | | | | | |
| PEC | ITY23PEP355 | IoT Networking Lab | Practical | 1 | - | 2 | 30 | 20 | 50 | - | 8 | 20 |
| | AIM23PEP353 | Speech Recognition Lab | | | | | | | | | | |
| | AIM23PEP354 | Steganography and Digital Watermarking Lab | | | | | | | | | | |
| MDM | | Refer Course no.4 of selected MDM from Appendix A | Lecture | 2 | 2 | - | 60 | 40 | 100 | - | 16 | 40 |
| VSEC | ITY23VSP301 | Mobile Application Development | Practical | 2 | - | 4 | 30 | 20 | 50 | - | 8 | 20 |
| TOTAL | | | | 22 | 16 | 12 | 510 | 340 | 850 | | | |

Nature of Course : L- Lecture, P-Practical, S-Seminar, J-Project, I-Internship, D-Dissertation,

Course Category: PC-Program Core, PE-Program Elective, MDM-Minor, OE- Open electives, VSC-Vocational skill course, SEC-Skill Enhancement course, AEC-Ability Enhancement course, IKS-Indian Knowledge system, VEC-Value Education course, OJT-On Job Training / Internship / Apprenticeship, FP-Field project, CEP-Community engagement and service, CC-Co – curricular course, RM-Research methodology, RP-Research project.

| Semester VII | | | | | | | | | | | | | |
|-----------------|-------------|-------------------------------------|------------------|--------|-----------------|----|-----|---------------------------|----------|-------|-------------------------|----------|-------|
| Course Category | Course Code | Course Title | Nature of Course | Credit | Teaching Scheme | | | Evaluation Scheme (Marks) | | | Minimum Passing (Marks) | | |
| | | | | | L | P | | Internal | External | Total | Internal | External | Total |
| PCC | DSC23PCL401 | Generative Adversarial Networks | Lecture | 3 | 3 | - | 60 | 40 | 100 | - | 16 | 40 | |
| PCC | ITY23PCL402 | Cloud Computing | Lecture | 2 | 2 | - | 60 | 40 | 100 | - | 16 | 40 | |
| PCC | ITY23PCP402 | Cloud Computing Lab | Practical | 1 | - | 2 | 30 | 20 | 50 | - | 8 | 20 | |
| MDM | | Course no.5 of selected MDM | Lecture | 2 | 2 | - | 60 | 40 | 100 | - | 16 | 40 | |
| PCC | ITY23PCL403 | Adv. Database Management System | Lecture | 2 | 2 | - | 60 | 40 | 100 | - | 16 | 40 | |
| PCC | ITY23PCL404 | Adv. Web Programming | Lecture | 2 | 2 | - | 60 | 40 | 100 | - | 16 | 40 | |
| PCC | ITY23PCP403 | Adv. Database Management System Lab | Practical | 1 | - | 2 | 30 | 20 | 50 | | 8 | 20 | |
| PCC | ITY23PCP404 | Adv. Web programming Lab | Practical | 1 | - | 2 | 30 | 20 | 50 | | 8 | 20 | |
| MDM | | Course no.6 of selected MDM | Practical | 2 | | 4 | 30 | 20 | 50 | - | 8 | 20 | |
| RM | ITY23RML401 | Research Methodology | Lecture | 4 | 4 | - | 60 | 40 | 100 | - | 16 | 40 | |
| RP | ITY23RPJ401 | Project | Project | 4 | - | 8 | 60 | 40 | 100 | - | 16 | 40 | |
| | | | | 24 | 15 | 18 | 540 | 360 | 900 | | | | |

Nature of Course : L- Lecture, P-Practical, S-Seminar, J-Project, I-Internship, D-Dissertation,

Course Category: PC-Program Core, PE-Program Elective, MDM-Minor, OE- Open electives, VSC-Vocational skill course, SEC-Skill Enhancement course, AEC-Ability Enhancement course, IKS-Indian Knowledge system, VEC-Value Education course, OJT-On Job Training / Internship / Apprenticeship, FP-Field project, CEP-Community engagement and service, CC-Co – curricular course, RM-Research methodology, RP-Research project.

| Semester VIII | | | | | | | | | | | | |
|-----------------------|------------------------------|--------------------------------------|---------------------|--------|-----------------|----|---------------------------|----------|-------|-------------------------|----------|-------|
| Course Category | Course Code | Course Title | Nature of Course | Credit | Teaching Scheme | | Evaluation Scheme (Marks) | | | Minimum Passing (Marks) | | |
| | | | | | L | P | Internal | External | Total | Internal | External | Total |
| Program Elective - IV | | | | | | | | | | | | |
| PEC | ITY23PEL452 | IoT Cloud | Lecture | 4 | 4 | - | 60 | 40 | 100 | - | 16 | 40 |
| PEC | AIM23PEL451 | Natural Language Processing | | | | | | | | | | |
| PEC | AIM23PEL452 | Cyber Security and Digital Forensics | | | | | | | | | | |
| Program Elective - V | | | | | | | | | | | | |
| PEC | ITY23PEL455 | Cyber Security in IoT | Lecture | 4 | 4 | | 60 | 40 | 100 | - | 16 | 40 |
| PEC | AIM23PEL453 | IPR | | | | | | | | | | |
| PEC | AIM23PEL454 | Robotics and Process Automation | | | | | | | | | | |
| OJT /RP | ITY23JTI451 / ITY23RPJ451 | Internship/ Project | Major Internship | 12 | - | 24 | 100 | 50 | 150 | - | 20 | 60 |
| | | | | 20 | 8 | 24 | 220 | 130 | 350 | | | |

Note-

Nature of Course : L- Lecture, P-Practical, S-Seminar, J-Project, I-Internship, D-Dissertation,

Course Category: PC-Program Core, PE-Program Elective, MDM-Minor, OE- Open electives, VSC-Vocational skill course, SEC-Skill Enhancement course, AEC-Ability Enhancement course, IKS-Indian Knowledge system, VEC-Value Education course, OJT-On Job Training / Internship / Apprenticeship, FP-Field project, CEP-Community engagement and service, CC-Co – curricular course, RM-Research methodology, RP-Research project.

Semester I

| | | |
|--|--|-------------------------|
| Course code: APS21BSL101 | Course name: Single Variable Calculus | Course category: |
| Basic Science | | |
| Credits: 4 Teaching scheme: L-4 hrs/week Evaluation scheme: CA-60, ESE-40 | | |
| Duration of External Examination- 2 Hrs | | |
| Pre-requisites: Pre-university mathematics. | | |
| Course Objectives: | | |
| 1. To develop mathematical models using standard functions. | | |
| 2. To determine derivatives of function. | | |
| Course Outcomes: At the end of the course, the students will be able to - | | |
| CO1: Represent function verbally, numerically, visually, algebraically and formulate a mathematical model using standard functions. | | |
| CO2: Find Limit of functions and use limit to find tangents and velocities which gives rise to derivative. | | |
| CO3: Trace the Cartesian curve, Parametric curve and Polar curve. Find arc length, area, volume and surface area using integrals. | | |
| CO4: Solve ordinary differential equations analytically and numerically and apply these methods to solve engineering problems. | | |

Contents –

| Unit | Contents | Teaching Hours |
|------|---|----------------|
| 1 | Differentiation and its Applications Limit ,Continuity and Differentiation, Rate of Change in sciences and Engineering, Chain Rule and implicit differentiation, Related rates, Extreme value theorem, Rolle’s Theorem, Lagrange’s Mean value theorems, Nth derivatives, Taylor and Maclaurin series Expansions, Linear approximations and Differentials. | 10 |
| 2 | Integration and its Applications Integration, Reduction formulae, Beta and gamma function, Properties, Evaluation of integrals using Beta and gamma functions, Application of Definite integrals to volume, arc length, surface of revolution, Work and Fluid Forces.. | 10 |
| 3 | Partial Differentiation and its Applications Limit and Continuity, Partial derivatives of first and higher orders, Total differentials, Errors and Approximations, Total derivative, Extreme values and saddle points, Method of Lagrange multipliers, Jacobians, Vector differentiation, Gradient, Curl and Divergence, directional derivatives. | 10 |
| 4 | Multiple Integrals and its Applications Double integrals ,Evaluation of Double integrals, Change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: Area and Volume, Root mean square value, Center of mass and Gravity (constant and variable densities); Triple integrals (Cartesian), Volume by triple integration. | 10 |
| 5 | Vector Integration and its Applications Line integrals, Surface integrals, Green’s Theorem, Stokes Theorems, Divergence theorems | 10 |

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| Text Books: 1. James Stewart, Calculus Early Transcendental, 7 th edition, Cengage. |
| 2. George B. Thomas, Ross L. Finney, Calculus and Analytical Geometry, 9th edition, Pearson |
| 3. Howard Anton, Irl Bivens, Stephens Davis, Calculus, 10th Edition, Wiley |
| Reference Books: 1. Shanti Narayan, Differential Calculus, S. Chand & Co. |
| 2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, New York. |
| 3. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi. |
| 4. P. N. Wartikar, J. N. Wartikar, Applied Mathematics (Vol I & II) , Pune Vidyarthi Griha Prakashan, Pune |
| 5. H. K. Das and Rajnish Verma, Higher Engineering Mathematics , S. Chand & CO. Pvt. Ltd., New Delhi |
| 6. K. D Joshi, Calculus for Scientists and Engineers, CRC Press. |
| 7 Prasad and Reena Garg, Advanced Engineering Mathematics, Khanna Publishing Company Private Limited, New Delhi. |
| Online Resources: 1. NPTEL / SWAYAM lectures. |

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Semester-I

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|---|
| Course code: APS21BSL102 Course name: Engineering Physics Course category: Basic Science |
| Credits: 3 Teaching scheme: L-3 hrs/week Evaluation scheme: CA–60, ESE–40 |
| Duration of External Examination- 2 Hrs |
| Pre-requisites: Students should know Basic Physics and basic Mathematics. |

Course Objectives: The Objective of this course is

| |
|--|
| 1. To impart knowledge in basic concepts of physics relevant to engineering applications. |
| 3. To introduce advances in technology for engineering applications. |
| 2. To introduce advances in technology for engineering applications |
| Course Outcomes: |
| CO1: Summarize fundamentals of electron optics, modern physics and ultrasonic waves related to the engineering fields. |
| CO2: Identify the importance of the optical phenomenon i.e interference, diffraction and polarization in relevance with its engineering applications. |
| CO3: Classify the material on the basis of electric conductivity as semiconductor and superconductors and dielectric materials this leads to their fascinating applications |
| CO4 Recognize the use of laser and optical fibers in various fields. |

Contents –

| Unit | Contents | Teaching Hours |
|------|---|----------------|
| 1 | Modern Physics Electron Optics: e/m by Thomson's method, Positive ray, Bainbridge mass spectrograph Quantum Mechanics: Role and concepts, De-Broglie's hypothesis, Uncertainty Principle, Fundamentals of quantum computing, Quantum Fundamentals of quantum computing, Quantum features Ultrasonic Waves: Production of ultrasonic waves (Magnetostriction & Piezoelectric method), Applications Numericals.. | 10 |
| 2 | Wave Optics Interference- Interference in thin films (reflected light), Newton's Rings, Engineering applications of Interference. Diffraction- Fresnel's and Fraunhofer Diffraction, Theory of plane transmission Grating Polarization- Polarization by reflection and double refraction, Optical activity, Specific rotation, Construction and working of Laurent's half shade polarimeter, Engineering applications of Polarization. Numerical. | 10 |
| 3 | Materials of Technological Importance Dielectric Materials: Introduction, Types of polarizations: Electronic and Ionic, Orientation Polarizations - Applications of Dielectrics Semiconducting Materials: Introduction, Fermi energy in Intrinsic semiconductors and extrinsic semiconductors, Hall effect, Applications of Semiconductors. Numericals Superconducting Materials: Introduction, Type I and Type – II superconductors, Meissner effect, BCS Theory, Application.. | 10 |

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|---|--|----|
| 4 | Optoelectronic Materials and Devices LASER : Absorption, spontaneous and stimulated emission, population inversion pumping mechanism, Construction and working of Ruby laser, Construction and working of He-Ne laser. Lasers in various technological applications. Introduction to Optical Fibers -Introduction Acceptance Angle-Numerical Aperture Applications of optical fibers. Numerical | 10 |
| 5 | Physics of Materials Crystal structure : Unit cell, Coordination number, atomic radius, packing density of cubic system. X-rays : Bragg's law, X-Ray Diffraction (XRD), Industrial Applications of X-Rays. Numerical . Particle detector : G.M. Counter Nano-Materials : Basic principles of nano- science and technology, properties, applications of nanotechnology. | 10 |

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| Text Books: 1.Engineering Physics- H.K. Malik & A.K. Singh, McGraw Hill publication. | | |
| 2.Engineering Physics - R.K. Gaur and S. L. Gupta. Dhanpat Rai Publications Pvt. Ltd.-New Delhi. | | |
| 3 M. N. Avadhanulu, P.G. Kshirsagar "A Text book of Engineering Physics"- S. Chand Publications. | | |
| 4.B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2012 | | |
| Reference Books: 1. Fundamental of Physics - Halliday and Resnik. Willey Eastern Limited. | | |
| 2. Introduction to Electrodynamics –David R. Griffiths. | | |
| 3 Concepts of Modern Physics – Arthur Beizer. Tata McGraw-Hill Publishing Company Limited. | | |
| 4. Optics – Ajoy Ghatak .Mac Graw Hill Education (India) Pvt. Ltd. | | |
| Online Resources: 1. NPTEL / SWAYAM lectures. | | |
| https://nptel.ac.in/courses/122107035/ Engineering Physics https://youtu.be/98xoZknQjI8 Polarization https://youtu.be/yINtzw63Knc Maxwell's Equations and EM theory https://youtu.be/bwreHReBH2A Maxwell's Equations and EM theory https://www.youtube.com/playlist?list=PLuv3GM6-gsE3-hVNaw-YEb7EeY5XVPZdz Maxwell's Equations and EM theory(nptel) https://nptel.ac.in/courses/115105120/ Experimental Physics https://youtu.be/2CsMpEBI5QY Crystal Structure and X- rays https://youtu.be/z_8aJPLr21E Crystal Structure and X- rays https://youtu.be/_Ckh-60B6LY Condensed matter Physics https://youtu.be/QQZ6EGf0Ju8 Magnetic Properties https://youtu.be/DDLjK1ODeg Magnetic Materials https://youtu.be/etjZmdmrjSU Dielectrics https://youtu.be/k6ZxP9Yr02E Semiconductor https://youtu.be/D-9M3GWoBrw Superconductivity https://youtu.be/GglT1RoBPzg Superconductivity https://youtu.be/VHp2Ff5N_bs Superconductivity https://youtu.be/FNp81kkxj5c LASER https://youtu.be/YvrwVK9ZqQY LASER https://nptel.ac.in/courses/115107095/ Optic Fiber https://youtu.be/cjBPnIXK60U Quantum Mechanics (Prof.H.C. Verma) https://youtu.be/BDuqChhUhM0 Divergence and Curl (Prof.H.C. Verma) https://youtu.be/sCviGSMaYfi Divergence and Curl (Prof.H.C. Verma) https://youtu.be/SZCsFS9izfQ Divergence and Curl | | |

And other related videos from following resources
www.nptel.ac.in ;www.swayam.gov.in;<https://inflibnet.ac.in/>

www.sciencedirect.com
<http://vlabs.iitb.ac.in/vlab/> www.youtube.com

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Semester-I

| | | |
|---|--|-----------------------------|
| Course code: APS21ESL101 | Course name: Python Programming | Course category: ESC |
| Credits: 2 Teaching scheme: L-2hrs/week Evaluation scheme: CA–60, ESE–40 | | |
| Duration of External Examination- 2 Hrs | | |
| Pre-requisites: Basic Computer Knowledge | | |
| Knowledge of any programming language (optional) | | |
| Course Objectives: | | |
| 1. To understand fundamental concepts in Python Programming | | |
| 2. To learn the different Conditional Loops and Iteration. | | |
| 3. To understand various data structures and packages | | |
| Course Outcomes: At the end of the course, the students will be able to - | | |
| CO1: Describe programming fundamentals of python. | | |
| CO2: Interpret the python syntax and semantics of control flow statements. | | |
| CO3: Identify the methods to create and manipulate programs with python data structures | | |
| CO4: Use modular approach for problem solving. | | |
| CO5: Apply advanced features and packages of python programming required for data science. | | |

Contents –

| Unit | Content | Teaching hours |
|------|--|----------------|
| 1 | Python for everybody Why Program, Hardware Overview, Python as a Language, Why Python Installation Python Jupyter notebook, Using the Python Playground, how to write program and compile in Jupyter notebook. Writing input and output statements in Python, output formatting, Writing comments keywords in Python .variables and variable assignments, Operators, writing expressions. | 6 |
| 2 | Conditional Loops and Iteration Conditional Statements, in Python, Loops and Iteration, Definite Loops, Finding the Largest Value, Loop Idioms. | 6 |
| 3 | Data Structures in Python Strings, Manipulating Strings, Files, Processing Files, Dictionaries, and sets, Tuples, Lists Manipulating Lists, Lists and Strings, Strings, Manipulating Strings. | 6 |
| 4 | Functions, Modules and Packages Functions, Lambda functions, Recursive function, Types of functions, modules and packages. | 6 |
| 5 | Packages in Python for Data Science Numpy introduction, Numerical operations on Numpy, Introduction of Matplotlib, getting started with Pandas, Data frames basics in Pandas, key operations on data frames. Introduction to Data Science, Binary search, finding elements in common in lists using Hash, Finding largest elements, Introduction of SQL | 6 |

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| Text Books: 1. D. Lee, “Python Programming Fundamentals”, Second Edition, Springer Publication.. 2. Wes McKinney, “Python for Data Analysis” O’Reilly Publication. |
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Reference Books: Reference Books:

1. The Python Language Reference: <http://docs.python.org/2/reference/index.html>
2. The Python Standard Library: <http://docs.python.org/2/library/>
3. <https://docs.scipy.org/doc/scipy/reference/tutorial/stats.html>
4. http://matplotlib.org/api/mlab_api.html#module-matplotlib.mlab
5. <http://conference.scipy.org/proceedings/scipy2010/pdfs/seabold.pdf>
6. <http://seaborn.pydata.org>
7. <https://www.datacamp.com/community/data-science-cheatsheets>
8. PEP 20 -- The Zen of Python: <https://www.python.org/dev/peps/pep-0020/>
9. <https://docs.scipy.org/doc/numpy-dev/user/numpy-for-matlab-users.html>

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Semester-I

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|---|
| Course code: MGM54AEL101 Course name: Communicative English Course category: AEC |
| Credits: 1 Teaching scheme: L-1hr/week Evaluation scheme: CA-30, ESE-20 |
| Pre-requisites: Basic knowledge of English. |
| Duration of External Examination- 2 Hrs |
| Course Objectives: |
| 1. The course aims at grooming the professional ethics of the students through various personality traits and behavioral patterns focusing on communication skills. |
| Course Outcomes: At the end of the course, the students will be able to - |
| CO1: Communicate formally with enhanced communication Competency. |
| CO2: Adapt professional nonverbal communication. |
| CO3: Construct English formal syntax and apply corporate vocabulary in written and verbal communication |
| CO4: Acquire listening and drafting skills with professional competency. |

Contents –

| Unit | Content | Teaching hours |
|------|---|----------------|
| 1 | Communication and Communication Process: Introduction to Communication, Forms and functions of Communication, Barriers to Communication and overcoming them, Ways of Effective Communication. | 5 |
| 2 | Non-verbal Communication And its types: Kinesics Occulesics Appearance roxemics Chronemics Paralanguage Qualities of effective speech. | 3 |
| 3 | English Grammar Overview of basic Mid-level grammar Tenses & concept of time, Sentence construction, Corporate vocabulary Difference between formal and informal sentences, phrases and words. | 3 |
| 4 | Listening Skills and Writing Skills Listening : Active and Passive Listening writing styles –layouts Business Letters- job application, resignation, resume . | 4 |

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| Text Books: 1. Ashraf Rizvi, Communication Skills for Engineers, Tata McGraw Hill. |
| 2. Sanjay Kumar, Pushp Lata, Communication Skills, Oxford University Press, 2016.. |
| 3. Meenakshi Raman, Sangeeta Sharma, Communication Skills, Oxford University Press, 2017 |
| 4. Teri Kwal Gamble, Michael Gamble, Communication Works, Tata McGraw Hill Education, 2010. |
| 5. Anderson, Kenneth. Joan Maclean and Tossny Lynch. Study Speaking: A Course in Spoken English for Academic Purposes. Cambridge: CUP, 2004. |
| 6. Bellare, Nirmala. Reading Strategies. Vols. 1 and 2. New Delhi. Oxford University Press, 1998 |
| 7. Bhasker, W. W. S & Prabhu, N. S.: English through Reading, Vols. 1 and 2. Macmillan, 1975 |

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| 8. Bovee Courtland, L and Thrill, John V. Business Communication, Today McGraw Hill, New York Taxman Publication (1989). |
| 9. Murphy, Raymond. Essential English Grammar, Cambridge: University Press (2000) |
| 10. Hewings Martin Advanced English Grammar Cambridge: University press (2003) |
| 11. Bansal Harrison. Spoken English |

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Semester-I

| | | |
|---|--|-----------------------------|
| Course code: APS21ESL102 | Course name: Engineering Graphics | Course category: ESC |
| Credits: 2 Teaching scheme: L-2 hrs/week Evaluation scheme: CA-60, ESE-40 | | |
| Duration of External Examination- 2 Hrs | | |
| Pre-requisites: NIL | | |
| Course Objectives: | | |
| 1. Understand the basic principles of engineering graphics and improve the visualization skills. | | |
| 2. To gain knowledge on projection of points, straight lines, planes, solids. | | |
| 3. To understand the real life objects through Drawings | | |
| 4. To know the principles of orthographic and isometric projections. | | |
| Course Outcomes: At the end of the course, the students will be able to - | | |
| CO1: Identify basic concepts in drawing and its application | | |
| CO2: Plan and prepare neat orthographic drawings of points, straight lines, planes and solids. | | |
| CO3: To visualize and draw orthographic and isometric projection of solids. | | |
| CO4: Acquire skill to draw real life engineering objects by using the engineering drawing. | | |

Contents –

| Unit | Content | Teaching hours |
|------|--|----------------|
| 1 | Projections of Straight Lines Introduction to Engineering Graphics, Need of Engineering Drawing, Drawing Instruments, BIS code of practice for general engineering drawing, Projections of Points in Four Quadrants, Projections of Points in Reference Plane, Line Parallel to both the Plane, Line Parallel to One Plane and Perpendicular to the other, Line Inclined to One Plane and Parallel to The Other, Line Inclined to Both the Reference Planes, Traces of Line (Only first quadrant to be considered). | 10 |
| 2 | Engineering Curves Curves used in Engineering Practice, Conic sections, Construction of conics by different methods, Rectangular-hyperbola, Cycloidal curves, Epi and hypo-cycloids, Involute and Archimedean spiral. | 10 |
| 3 | Projections of Planes Plane with Surface Parallel to One Plane and Perpendicular to other, Plane Inclined to One Plane and Perpendicular to other, Projections of Planes Inclined to both the Planes . | 10 |
| 4 | Projections of Solids Introduction to Solids: Prisms, Pyramid, Cylinder, Cone, Cube, Tetrahedron, Sphere, Projections of above Solids with Axis inclined to one plane, Projections of above solids with Axis inclined to both the Planes, Projection of composite solids (different arrangement of Spheres with above Solids). | 10 |
| 5 | Orthographic Projections Orthographic projections of different Machine Parts (First Angle Projection method only) . | 10 |

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|---|--|----|
| 6 | Isometric Projections ,Introduction to CAD Introduction to Pictorial views, Converting Orthographic Projections into Isometric Projections and Isometric views. Listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects. | 10 |
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| Text Books: 1. N. D. Bhatt and Panchal V. M., “Engineering Drawing”, Charotar Publishing House, Anand |
| 2. P. J. Shah , “ A Text Book of Engineering Drawing”, S.Chand, New Delhi |
| 3. Shah M.B. & Rana B.C, “Engineering Drawing & Computer Graphics”, Pearson Publications, |
| 4. Agrawal B.& Agrawal C.M, “Engineering Graphics”, TMH Publications |
| 5. Narayana K.L. & P. Kannaiyah, “Engineering Drawing”, Scitech Publications |
| 6. P.I Vargese, “Engineering Graphics”, Mcgraw Hill Publications |
| 7. D.A.Hindoliya,” Engineering Graphics”, B. S. Publications |
| Reference Books: 1 Dabhade M. L., “Engineering Graphics”, Vol.-I and Vol.-II, Vision Publications, Pune |
| 2. K.Venugopal, "Engineering Drawing and Graphics" ,New Age International Publishers. |

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Semester-I

| | | |
|--|---|-------------------------|
| Course code: APS21BSP101 | Course name: Engineering Exploration | Course category: |
| VSEC | | |
| Credits: 2 Teaching scheme: P-4 hrs/week Evaluation scheme: TW-60, PR-40 | | |
| Pre-requisites: NIL. | | |
| Lab Objectives: | | |
| 1. Understand the principles of Engineering Design and apply them to identify product requirements, objectives, and constraints through interactions with clients, users, and relevant stakeholders. | | |
| 2. Develop critical thinking and problem-solving skills to analyze existing technologies, conduct surveys, study literature, and generate creative design concepts using various means and combinations | | |
| 3. Acquire proficiency in using appropriate tools and techniques to generate electronic and mechanical simulations, schematic diagrams, and product concept sketches or CAD models for effective communication of design ideas. | | |
| 4. Demonstrate competency in categorizing inputs and outputs of systems in terms of materials, information, and energy, enabling a holistic understanding of engineering projects. | | |
| 5. Cultivate effective teamwork and communication skills to collaborate with peers, mentors, and team members during the development and presentation of engineering prototypes. | | |
| 6. Develop the ability to evaluate, defend, and communicate design decisions, progress, and project outcomes, showcasing awareness of course concepts and their application in real-world scenarios. | | |
| Lab Outcomes: On completion of the course, the student should be able to: | | |
| LO1: Effectively interact with clients, users, and stakeholders to gather relevant information and derive product requirements, thereby demonstrating proficiency in Requirement Analysis and Client Interaction. | | |
| LO2: Analyze and compare existing technologies, conduct surveys, and study literature to identify potential solutions, and develop objective trees and function trees, reflecting their competency in C conceptual Design and Analysis. | | |
| LO3: Create product concept diagrams, combining different means, and prepare sketches or CAD models to present their design ideas aesthetically and coherently, indicating proficiency in Product Concept Development. | | |
| LO4: Categorize system inputs and outputs in terms of materials, information, and energy, illustrating their understanding of System Categorization and Analysis. | | |
| LO5: Exhibit hands-on skills in physical assembly, connection, and demonstration of engineering prototypes, showcasing Proficiency in Prototyping and Implementation | | |
| LO6: Explain and defend their design choices, project progress, and outcomes during presentations, demonstrating Communication Skills, Project Evaluation, and Awareness of Engineering Concepts | | |

Course Contents

The course is conducted in the following modules:

1. Introduction to Engineering Exploration
2. Engineering Design
3. Platform Based Development
4. Mechanisms
5. Data acquisition and analysis
6. Engineering Ethics
7. Project Management

The following practical contents are delivered in an integrated mode along with theory:

1. Conceptualizing a product
2. Designing a product with constraints
3. Simulation of electronic circuits (at least 10 sets)
4. Implementation of electronic circuits (at least 5 sets)
5. Implementation of four bar chain mechanism
6. Conversion of problem statement to need statement
7. Identification of objectives, constraints and functions
8. Generation of black box, glass box and expanded class box
9. Generation of morphological chart
10. Generation of concepts
11. Comparison of concepts
12. Selection of concept
13. Implementation and testing of prototype

Text Books: 1. James Stewart, Calculus Early Transcendental, 7th edition, Cengage.

2. Shanti Narayan, Differential Calculus, S. Chand & Co.

- **Reference Books:** George E. Dieter and Linda C. Schmidt (2009), Engineering Design, 4ed, McGraw Hill Higher Education
- Clive L. Dym, Patrick Little, and Elizabeth J. Orwin (2014), Engineering Design: A project-based introduction, 4ed, John Wiley and Sons
- G. Pahl, W. Beitz, J. Feldhusen and K.-H. Grote (2007), Engineering Design: A systematic approach, 3ed, Springer, New York.

Semester-I

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|--|
| Course code: APS21BSP101 Course name: Engineering Physics Lab Course category: Basic Science |
| Credits: 1 Teaching scheme: P-2 hrs/week Evaluation scheme: TW-30, PR-20 |
| Pre-requisites: Student should know the basic aspects of measurements like least count and range of instrument, scale identification, accuracy, error etc.. |
| Lab Objectives: The Objectives of this course is |
| 1. To make the students gain practical knowledge to co-relate with the theoretical studies |
| 2. To achieve perfectness in experimental skills. |
| 3. To study practical applications will bring more confidence |
| Lab Outcomes: At the end of the course, the students will be able to - |
| LO1: Plot the I-V characteristics of pn junction diode and determine the value of band gap energy which can be used for core engineering Courses.. |
| LO2: Perform optical experiments; using light properties like interference, polarization, diffraction and their applications |
| LO3: Interpret the results and analyze the data and use the experimental data to plot the graph for a best fit. |
| LO4: Discuss the characteristics of plateau region and determine operating voltage of G.M counter. |
| LO4: Determine the numerical aperture and bending loss of optical fiber cable. |

List of Practicals –

| Unit | Content |
|------|---|
| 1 | Thomson's Bar Magnetic method -Determination of e/m of electron . |
| 2 | Newton's rings -Determination of radius of curvature of Plano convex lens. |
| 3 | Polarization - Half shade Polarimeter -Determination of specific rotation of optically active material. |
| 4 | Diffraction - Determination of wavelength of light by plane transmission grating. |
| 5 | Wedge Shaped film -Determination of thickness of thin wire. |
| 6 | Semiconductors – To study of forward and reverse bias characteristic of Semiconductors diode. |
| 7 | Fibre Optics – Determination of Bending losses in optical fibre |
| 8 | Fibre Optics – Determination of Numerical Aperture of given optical fibre |
| 9 | Determination of operating voltage of G.M tube and characteristics of plateau region |
| 10 | Determination of wavelength of laser source. |

Semester-I

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| Course code: APS21ESP101 Course name: Python Programming Lab Course category: ESC |
| Credits: 1 Teaching scheme: P-2 hrs/week Evaluation scheme: TW-30, PR-20 |
| Pre-requisites: Nil. |
| Lab Objectives: |
| 1.To develop mathematical models using standard functions. |
| 2.To determine derivatives of function. |
| Lab Outcomes: At the end of the course, the students will be able to - |
| LO1: Demonstrate python program using development environment |
| LO2: Find Develop logical thinking to solve the problems using programming fundamental concepts.. |
| LO3: Construct python program using various data structures. |
| LO4: Apply modularization approach for solving complex problem. |
| LO5: Make use of various packages in Python for data science |
| LO6: Implement different SQL commands in python |

Contents –

| Unit | Content | Teaching hours |
|------|--|----------------|
| 1 | Program to perform input/output operations Write a program to take input (integer, float, string) and print it. | 10 |
| 2 | Program based on operators <ol style="list-style-type: none"> 1. Write a program to simulate a simple calculator (+ - / * %) that takes two operands as input and displays the result 2. Write a program to find area and perimeter of geometric objects. 3. The distance between two cities (in km.) is input through the keyboard. 4. Write a program to convert and print this distance in meters, feet, inches and centimeters 5. Write a Program to interchange two numbers. 6. Write a program to compute Fahrenheit from centigrade | 10 |
| 3 | Programs based on Decision making. <ul style="list-style-type: none"> • Write a program to read marks from keyboard and your program should display equivalent grade according to following table(else-if) (ladder) Marks Grade 100 - 80 Distinction 79 - 60 First Class 59 - 40 Second Class < 40 Fail • Write a program to input basic salary of an employee and calculate gross salary according to given conditions. Basic Salary <= 10000 : HRA = 20%, DA = 80% | 10 |

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| | <p>Basic Salary is between 10001 to 20000 : HRA = 25%, DA = 90%</p> <p>Basic Salary >= 20001 : HRA = 30%, DA = 95%</p> <ul style="list-style-type: none"> • If the ages of three brothers are input through the keyboard, write a C Program to determine the youngest and oldest of the three. • Write a program to calculate overtime pay of employee. Overtime is paid at the rate of Rs. 12.00 per hour for every hour worked above 40 hours. Assume that employee do not work for fractional part of an hour. | |
| | <p>Write a program for checking the speed of drivers:</p> <p>If speed is less than 70, it should print "Ok". Otherwise, for every 5km above the speed limit (70), it should give the driver one demerit point and print the total number of demerit points. For example, if the speed is 80, it should print: "Points: 2". If the driver gets more than 12 points, the function should print: "License suspended"</p> | 10 |
| | <p>Programs using while and for loops</p> <ul style="list-style-type: none"> • WAP to find factorial of given number • WAP to check whether given number is Palindrome or not • WAP to check whether given number is Armstrong or not • WAP to print Fibonacci series <p>5. Write a Python program which iterates the integers from 1 to 50. For multiples of three print "Fizz" instead of the number and for the multiples of five prints "Buzz". For numbers which are multiples of both three and five print "FizzBuzz".</p> <p>6. WAP to check whether given number is Perfect number or not</p> <p>7. WAP to check whether given number is Prime number or not</p> <p>8. Write C program to print given star and number patterns and reverse it.</p> <p>1. * 1</p> <p>2. ** 12</p> <p>3. *** 123</p> <p> **** 1234.</p> | 10 |
| | <p>Programs on string</p> <ol style="list-style-type: none"> 1. Write Python Program to find length of string without using len() function. 2. Count all letters, digits, and special symbols from a given string. 3. Python Program to Count the Number of Vowels in a String. 4. Python Program to Calculate the Number of Upper Case Letters and Lower Case Letters in a String. 5. Python Program to Check whether given string is palindrome or not 6. Write a Python program to merge two Python dictionaries 7. Write a Python program to get the maximum and minimum value in a dictionary 8. Write a Python program to create set difference, Union and intersection 9. Write a Python program to check if two given sets have no elements in common | 10 |
| | <p>Programs using function</p> <ol style="list-style-type: none"> 1. Write Functions to calculate your trip's costs: 2. Define a function called hotel cost with one argument nights as input 3. Define a function called plane_ride_cost that takes a string, city, as input. 4. Define a function called rental_car_cost with an argument called days. | 10 |

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| | <ol style="list-style-type: none"> 5. Define a function called trip_cost that takes two arguments, city and days. Like the example above, have your function return the sum of calling the rental_car_cost (days), hotel_cost (days), and plane_ride_cost (city) functions. 6. Write a program in to check a given number is even or odd using the function. 7. Write a function Exchange to interchange the values of two variables, say x and y. illustrate the use of this function in a calling function. 8. Write a program to find Sum of natural number using recursion 9. Write a program to print Fibonacci series number using recursion | |
| | <p>Program using NumPy, Matplotlib and Pandas library</p> <ol style="list-style-type: none"> 1. Write a program to perform matrix addition, subtraction, multiplication. 2. Plot all types of graph using Matplotlib. 3. Write a program which perform basic operation of Pandas | 10 |
| | <p>Program on SQL Commands</p> <ul style="list-style-type: none"> • Write a program of binary search • Write a program which perform basic SQL commands • Programs based on real life problems/GUI based programs | 10 |

MGMUNIVERSITY

Semester-I

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| Course code: APS21ESP102 Course name: Engineering Graphics Studio Course category: ESC |
| Credits: 2 Teaching scheme: P-4 hrs/week Evaluation scheme: TW-30, PR-20 |
| Pre-requisites: Nil |
| Course Objectives: The Objectives of this course is to develop the skills required for Engineering drawing. |
| Course Outcomes: At the end of the course, the students will be able to - |
| CO1: Develop competence in correct expression of the visualized objects |
| CO2: Dimension and annotate two-dimensional engineering drawings |
| CO3: .Plan and prepare neat orthographic drawings of points, straight lines, planes and solids |
| CO4: Develop the ability to visualize and draw orthographic and isometric projection of solids |

Lab Contents

| Lab | Content |
|------------|--|
| 1 | Drawing three problems based on projections of lines on half imperial size drawing sheet. |
| 2 | Drawing three problems based on engineering curves on half imperial size drawing sheet. |
| 3 | Drawing three problems based on projections of planes on a half imperial size drawing sheet. |
| 4 | Drawing three problems based on projections of solids on a half imperial size drawing sheet. |
| 5 | Drawing three problems based on orthographic projection on a half imperial size drawing sheet. |
| 6 | Drawing three problems based on isometric projections on half imperial size drawing sheet |
| 7 | Demonstration of CAD software in CAD lab, drawing simple objects using various commands |

Semester-I

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| Course code: APS21ESP103 Course name: Recent Trends In Integrated Technologies Course category: ESC |
| Credits: 1 Teaching scheme: P-2 hrs/week Evaluation scheme: TW–30, PR–20 |
| Pre-requisites: Pre-university mathematics. |
| Lab Objectives: |
| 1. To introduce students the basics of additive manufacturing/rapid prototyping and its applications in various fields, reverse engineering techniques. |
| 2.To recognize industrial control problems suitable for Industrial Robotics. |
| 3. To acquire basic skills in exploring the potential of the drone technology in professional activities |
| 4. Ability to recognize industrial automation problems suitable for PLC control |
| Lab Outcomes: , the students will be able to - |
| LO1: Prepare 3D Model (slice & print) in either Stratasys or Zortrax & generate scan data through Hexagon portable scanning arm |
| LO2: Describe basic industrial robotics & it's applications. |
| LO3: Operate a small drone in a controlled environment. |
| LO4: Explain principles of sensor, PLC & applications. |

Contents –

| Unit | Content | Teaching hours |
|------|---|----------------|
| 1 | Scan to CAD, CAD to STL conversion& patching, machine setup & processes for printing | 7 |
| 2 | Programming the TATA Robot(pendant) for pick & place, programming the Yaskawa Robot(pendant) for motion planning, Demonstrate welding exercise by the instructor. | 8 |
| 3 | Introduction to components of drone, Demonstration of assembly of drone, Demonstration of mission planning & flying the drone. | 7 |
| 4 | Controller & sensor & their interfacing, basic ladder logic instructions, pneumatic& hydraulic actuator | 8 |

Text Books:

1. A Step-by-Step Guide For Beginners: Aircraft Design & Construction Design Guide by :Merlin Debrie
2. Industrial Automation & Robotics By A.K. Gupta & S.K.Arora
3. Additive Manufacturing Principles, Technologies & Applications By C.P.Paul (TMH)
4. Basics of unmanned aerial vehicle By Garvit Pandya (Motion press)

Semester-I

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| Course code: MGM54AEP101 Course name: Communicative English Lab Course category: AEC |
| Credits: 1 Teaching scheme: P-2 hrs/week Evaluation scheme: TW-30, PR-20 |
| Pre-requisites: Basic knowledge of English. |
| Lab Objectives: The course aims at grooming the professional ethics of the students through various personality traits and behavioral patterns focusing on communication skills |
| Lab Outcomes: the students will be able to - |
| LO1: Introduce themselves formally and informally through practice. |
| LO2: Pronounce English vowel and Consonant sounds effectively. |
| LO3: Participate effectively in G.Ds, Presentations, & Interviews. |
| LO4: Face Interviews competently. |
| LO5: Draft resume, business letters, reports formally. |
| LO6: Comprehend the meaning of English text by comprehension techniques. |

Contents –

| Unit | Content |
|------|---|
| 1 | Self Introduction. |
| 2 | Pronunciation of Vowel sounds in English |
| 3 | Pronunciation of consonant sounds in English. |
| 4 | Group discussion. |
| 5 | Presentation techniques. |
| 6 | Interview techniques. |
| 7 | Letter writing. |
| 8 | Email writing, Agenda of the meeting and notices. |
| 9 | Resume Writing. |
| 10 | Report writing. |
| 11 | Skimming & Scanning. |

Semester-I

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| Course code: MGM82CCP101 Course name: National Cadet Corps Course category: CCA |
| Credits: 2 Teaching scheme: P-4 hrs/week Evaluation scheme: TW–30, PR–20 |
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| Pre-requisites: Nil |
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Contents –

| Unit | Content | Teaching hours |
|-------------|--|-----------------------|
| 1 | NCC General, National Integration and Awareness, Social Service and Community Development, Drill: Aims, Objectives and Organization of NCC, Duties of NCC Cadet, National Integration Importance and Necessity, Factors Affecting National Integration, Foot Drill, Drill With Arms, Ceremonial Drill with Arms, Social Service and Community Development Activities- Pollution, Mission Indradhanush, Beti Bachao Beti Padhao, Tree Plantation, Digital Awareness. | 12 |
| 2 | Personality Development, Disaster Management, Weapon Training, Map Reading : Critical and Creative Thinking, Decision Making, Self Awareness, Public Speaking, Interview Skills, Types, Org, Capability and Role of NCC cadets, Initiative Trg, Organizing Skills, Do's & Don't, Introduction and Characteristics of .22 rifles, Handling of .22 rifle, Introduction to Map Reading, Conduct of MR-Google and Tourist Maps and Apps. | 10 |
| 3 | Health and Hygiene, Environmental Awareness and Conservation, Adventure, Obstacle Training: Hygiene & Sanitation (Personal & Camp Hygiene) Soch Vichar, First Aid in Common Medical Emergencies, Treatment & Care of Wounds, Introduction Yoga & Exercises, Water Conservation, Energy Conservation, Introduction Adventure Activities. Obstacle Course | 10 |
| 4 | Leadership, Introduction to Infantry Weapons and Equipments: Traits, Indicators, Motivation, Ethics, Case Studies- Chhatrapati Shivaji Maharaj, Maharana Pratap, Jhasi ki Rani, Ratan Tata, Narayan Murty, Rabindra Nath Tagor, Organization of Infantry Battalion and its weapons. | 8 |
| 5 | Armed Forces, Field Craft and Battle Craft, : Armed Forces, Army, CAPF, Police, Modes of Entry to Army, CAPF, Police, Introduction to Field Craft, Indication of Landmark, Observation, Camouflage and Concealment, Fire and Move Capsule. | 8 |

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| Text Books: 1. James Stewart, Calculus Early Transcendental, 7 th edition, Cengage. |
| 2. George B. Thomas, Ross L. Finney, Calculus and Analytical Geometry, 9th edition, Pearson |
| 3. Howard Anton, Irl Bivens, Stephens Davis, Calculus, 10th Edition, Wiley |
| References: |

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| 1. Cadet's Handbook- Common Subject, all wings by DG NCC, New Delhi. |
| 2. Cadet's Handbook- Common Subject by NCC Directorate- Bhubaneshwar. |
| 3. Cadet's Handbook- Specialised Subjects, Army, Navy, Air-Force by DG NCC, New Delhi. |
| 4. NCC OTA Precise by DG NCC, New Delhi. |
| 5. Chanakya's 7 Secrets of Leadership by Radhakrishanan Pillai and D. Shivnandhan. |
| 6. National Cadets Corps (India) by Lambert M. Suvarkar. |
| E-Resources: |
| 1. National Cadet Corps, Youth in Action (Google eBook). |
| 2. https://indiancc.nic.in/dg-ncc-lt-gen-gurbirpal-singh/ www.youtube.com |

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Semester-I

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| Course code: APS21BSL102 Course name: Yoga Course category: CCA |
| Credits: 2 Teaching scheme: P-4 hrs/week Evaluation scheme: TW-30, PR-20 |
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| Pre-requisites: Students should know Basic. |

| Unit | Content | Teaching hours |
|------|--|----------------|
| 1 | <p>Yoga History of Yoga Yoga is a mind and body practice with a 5,000-year history in ancient Indian philosophy.</p> <p>The word "yoga" comes from the Sanskrit word "yuj," which means "to yoke" or "to unite."</p> <p>Yoga is a system of physical postures, breathing exercises, and meditation designed to help practitioners achieve physical, mental, and spiritual well-being. The earliest written records of yoga date back to the 2nd century BCE, and the practice has been evolving ever since.</p> <p>Yoga has spread to all corners of the world, and there are now many different styles of yoga practiced today.</p> <p>Fundamental Skills of Yoga Postures: The postures, or asanas, are the physical component of yoga. There are many different postures, and they can be practiced in a variety of ways.</p> <p>Breathing: Breathing, or pranayama, is an important part of yoga. There are many different breathing techniques, and they can be used to help relax the body and mind.</p> <p>Meditation: Meditation is the mental component of yoga. There are many different meditation techniques, and they can be used to help focus the mind and achieve a state of peace.</p> | 20 |
| 2 | <p>Swimming History of Swimming Swimming is one of the oldest sports in the world, with evidence of swimming dating back to 2500 BC. The earliest recorded swimming competitions were held in ancient Greece and Rome. Swimming became an Olympic sport in 1896, and it has been a part of every Game since then.</p> <p>Swimming is now a popular sport all over the world, and there are many different types of swimming, including freestyle, backstroke, breaststroke, butterfly, and individual medley.</p> <p>Fundamental Skills of Swimming Breathing: Breathing is one of the most important skills in swimming. It is important to be able to breathe efficiently while swimming in order to avoid getting tired.</p> <p>Body Position: Body position is another important skill in swimming. It is important to maintain a good body position in order to be hydrodynamic and to swim efficiently.</p> | 20 |

Stroke Technique: Stroke technique is the way that the arms and legs are used to propel the body through the water. There are many different stroke techniques, and it is important to develop a good stroke technique in order to swim efficiently.

Drills: Drills are exercises that can be used to improve swimming skills. There are many different drills, and they can be used to improve different aspects of swimming, such as breathing, body position, and stroke technique.

Mental Toughness: Mental toughness is also an important skill in swimming. It is important to be able to stay focused and motivated during long swims, especially in competitions.

MGMUNIVERSITY

Semester-I

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| Course code: MGM82CCP103 Course name: Sports Course category: CCA |
| Credits: 02 Teaching scheme: P-4hrs/week Evaluation scheme: TW-30, PR-20 |
| Pre-requisites: Student should know Basic Physics and basic Mathematics. |
| Course Objectives: The Objective of this course is |
| 1. To understand the importance of sports in physical and mental development. |
| 2. To learn about the different types of sports |
| 3. To learn about the different types of indoor games . |
| 4. To participate in indoor games. |
| 5. To learn about the different types of outdoor games. |
| 6. To participate in outdoor games |
| Course Outcomes: |
| Upon completion of this course, students will be able to |
| 1. Demonstrate knowledge of the history, benefits, types, equipment, and safety of sports. |
| 2. Demonstrate proficiency in the basic skills of indoor and outdoor games |
| 3. Understand the rules and regulations of selected sports |
| 4. Participate in sports competitions. |

Contents –

| Unit | Content | Teaching hours |
|------|---|----------------|
| | <p>Football</p> <p>The earliest forms of football can be traced back to ancient China, Greece, and Rome.</p> <p>In England, the game of football developed in the 19th century, with different rules being used by different schools and organizations.</p> <p>In 1863, the Football Association (FA) was founded, and it standardized the rules of the game.</p> <p>The first international match was played between England and Scotland in 1872.</p> <p>Football became an Olympic sport in 1900, and the first World Cup was held in 1930.</p> <p>Today, football is the most popular sport in the world, with billions of fans around the globe.</p> <p>Fundamental Skills of Football</p> <p>Dribbling: Dribbling is the ability to move the ball with your feet while keeping control of it. It is an essential skill for all footballers, as it allows you to move past defenders and create scoring opportunities.</p> <p>Passing: Passing is the ability to accurately and effectively throw the ball to your teammates. It is another essential skill, as it allows you to move the ball up the field and create scoring opportunities.</p> <p>Shooting: Shooting is the ability to kick the ball with power and accuracy. It is the most important skill for scoring goals, and it is essential for all footballers to develop a good shot.</p> <p>Heading: Heading is the ability to use your head to control and direct the ball. It is a</p> | 10 |

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| | <p>valuable skill for both attacking and defending, and it is important for all footballers to learn how to head the ball effectively.</p> <p>Tackling: Tackling is the ability to take the ball away from an opponent. It is an important skill for defenders, but it is also valuable for midfielders and attackers.</p> | |
| 1 | <p>Basket Ball</p> <p>Basketball was invented by James Naismith in 1891 at the International YMCA Training School in Springfield, Massachusetts.</p> <p>Naismith was a physical education instructor who was looking for a game that would be less injury-prone than football.</p> <p>He nailed two peach baskets to the lower rail of a balcony and used a soccer ball to play the game.</p> <p>The first game of basketball was played on December 21, 1891, with nine players on each team.</p> <p>The rules of basketball have evolved over time, but the basic premise of the game has remained the same.</p> <p>Today, basketball is one of the most popular sports in the world, with millions of players and fans around the globe.</p> <p>Fundamental Skills of Basketball</p> <p>Dribble: Dribbling is the ability to move the ball with your hands while keeping control of it. It is an essential skill for all basketball players, as it allows you to move past defenders and create scoring opportunities.</p> <p>Passing: Passing is the ability to accurately and effectively throw the ball to your teammates. It is another essential skill, as it allows you to move the ball up the court and create scoring opportunities.</p> <p>Shooting: Shooting is the ability to throw the ball through the hoop with power and accuracy. It is the most important skill for scoring points, and it is essential for all basketball players to develop a good shot.</p> <p>Rebounding: Rebounding is the ability to catch the ball after it has been missed by a shooter. It is an important skill for both offense and defense, as it allows teams to get second chances at scoring.</p> <p>Defense: Defense is the ability to prevent the other team from scoring points. It is an essential skill for all basketball players, as it is impossible to win a game without playing good defense.</p> | 10 |

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| | <p>Volleyball</p> <ol style="list-style-type: none"> 1. Volleyball was invented in 1895 by William G. Morgan, a physical education instructor at the Young Men's Christian Association (YMCA) in Holyoke, Massachusetts. 2. Morgan was looking for a game that would be less vigorous than basketball and he created volleyball as a way to keep his students active during the winter months. 3. The original name of the game was "mintonette," but it was renamed "volleyball" in 1896. <ol style="list-style-type: none"> 1. Volleyball quickly spread throughout the United States and around the world, and it became an official Olympic sport in 1964. <p>Fundamental Skills of Volleyball</p> <p>Passing: Passing is the ability to receive the ball from the opponent and direct it to a teammate. It is an essential skill for all volleyball players, as it allows the team to keep possession of the ball and start an attack.</p> <p>Setting: Setting is the ability to control the height and direction of the ball so that a teammate can spike it. It is a critical skill for setters, as they are responsible for setting up the team's offense.</p> <p>Spiking: Spiking is the ability to hit the ball over the net with power and accuracy. It is the most important skill for scoring points in volleyball, and it is essential for all attackers to develop a good spike.</p> <p>Blocking: Blocking is the ability to prevent the opponent from spiking the ball over the net. It is an important skill for blockers, as they can prevent the other team from scoring points.</p> <p>Digging: Digging is the ability to prevent the opponent from scoring a point by returning the ball over the net. It is an important skill for all defenders, as they are responsible for preventing the other team from scoring points</p> | 10 |
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| 2 | <p>4 Kabaddi History of Kabaddi Kabaddi is a contact team sport that originated in India.</p> <p>It is believed to have originated in the Indian subcontinent over 4,000 years ago.</p> <p>The game is mentioned in the Sangam literature of Tamil Nadu, which dates back to the 3rd century BC.</p> <p>Kabaddi was first played as a competitive sport in the Indian Olympic Games in 1938.</p> <p>It was included as a demonstration sport at the 1982 Asian Games in Delhi, and it became a full medal sport in the 1990 Asian Games in Beijing.</p> <p>Kabaddi is now played in over 100 countries around the world.</p> <p>Fundamental Skills of Kabaddi</p> <p>Dabki: Dabki is the act of entering the opponent's half of the court while chanting "kabaddi, kabaddi." It is a fundamental skill for all raiders, as it allows them to enter the opponent's half of the court without being tackled.</p> <p>Touch: Touching an opponent is the most important skill in kabaddi. It is how raiders score points for their team. There are many different ways to touch an opponent, such as touching their arm, leg, or torso.</p> <p>Tackling: Tackling is the act of preventing a raider from touching an opponent. It is a fundamental skill for all defenders, as it allows them to prevent the other team from scoring points. There are many different ways to tackle a raider, such as grabbing them, pushing them, or tripping them.</p> <p>Stamina: Stamina is essential for all kabaddi players, as the game is very physically demanding. Players need to be able to run, jump, and tackle for long periods of time.</p> <p>Agility: Agility is also important for kabaddi players, as they need to be able to change direction quickly and avoid being tackled.</p> | 10 |
| 4 | <p>Unit-2</p> <p>Badminton</p> <p>History of Badminton The game of badminton originated in ancient Greece, China, and India.</p> <p>It was brought to England in the 1870s by British army officers stationed in India.</p> <p>The first badminton club was founded in 1873 at Badminton House, the country estate of the Duke of Beaufort.</p> <p>The first official all-England badminton championships for men were held in 1899, and the first badminton tournament for women was arranged the next year.</p> <p>Badminton became an Olympic sport in 1992.</p> <p>Today, badminton is a popular sport played by millions of people around the world.</p> <p>Fundamental Skills of Badminton</p> | 10 |

Grip: The grip is the most important fundamental skill in badminton. It allows you to control the racket and hit the shuttlecock with power and accuracy. There are many different grips, but the most common are the forehand grip and the backhand grip.

Footwork: Footwork is essential for moving around the court and positioning yourself to hit the shuttlecock. There are many different footwork drills that you can practice to improve your footwork.

Racket control: Racket control is the ability to hit the shuttlecock with power and accuracy. It is important to practice hitting the shuttlecock in different directions and with different levels of power.

Timing: Timing is the ability to hit the shuttlecock at the right time. It is important to practice hitting the shuttlecock at the peak of its flight.

Stamina: Stamina is essential for badminton, as it is a physically demanding sport. You need to be able to run, jump, and hit the shuttlecock for long periods of time.

Soft Tennis

History of Soft Tennis

Soft tennis is a racquet sport that originated in Japan in the early 20th century. It was created as a less dangerous alternative to lawn tennis, as the ball used in soft tennis is made of foam rubber and does not travel as fast as a regular tennis ball.

The first soft tennis tournament was held in Japan in 1921, and the sport quickly spread to other countries in Asia.

Soft tennis was first introduced to the United States in the 1950s, and it has since become a popular recreational sport in the country.

Fundamental Skills of Soft Tennis

Grip: The grip is the most important fundamental skill in soft tennis. It allows you to control the racquet and hit the ball with power and accuracy. There are many different grips, but the most common are the forehand grip and the backhand grip.

Footwork: Footwork is essential for moving around the court and positioning yourself to hit the ball. There are many different footwork drills that you can practice to improve your footwork.

Racket control: Racket control is the ability to hit the ball with power and accuracy. It is important to practice hitting the ball in different directions and with different levels of power.

Timing: Timing is the ability to hit the ball at the right time. It is important to practice hitting the ball at the peak of its flight.

Stamina: Stamina is essential for soft tennis, as it is a physically demanding sport. You need to be able to run, jump, and hit the ball for long periods of time.

Here are some additional fundamental skills of soft tennis:

Ball control: The ability to control the direction and speed of the ball.

Serve: The ability to serve the ball accurately and with power.

Volley: The ability to hit the ball before it bounces.

Overhead smash: The ability to hit the ball forcefully and accurately overhand.

Drop shot: The ability to hit the ball softly and precisely so that it bounces low and close to the net.

Tennis

History of Tennis

The origins of tennis can be traced back to a 12th–13th-century French handball game called jeu de paume (“game of the palm”), from which was derived a complex indoor racket-and-ball game: real tennis.

The modern game of lawn tennis was invented in England in the 1870s by Major Walter Winfield.

Wing field created a set of rules and equipment for the game, and he called it "Sphairistike". The game quickly became popular, and it was renamed "lawn tennis" in 1874.

The first lawn tennis tournament was held in 1877 at the All England Club in Wimbledon, England.

Tennis became an Olympic sport in 1896.

Today, tennis is a popular sport played by millions of people around the world.

Fundamental Skills of Tennis **Grip:** The grip is the most important fundamental skill in tennis. It allows you to control the racket and hit the ball with power and accuracy. There are many different grips, but the most common are the forehand grip and the

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| 5 | <p>backhand grip.</p> <p>Footwork: Footwork is essential for moving around the court and positioning yourself to hit the ball. There are many different footwork drills that you can practice to improve your footwork.</p> <p>Racket control: Racket control is the ability to hit the ball with power and accuracy. It is important to practice hitting the ball in different directions and with different levels of power.</p> <p>Timing: Timing is the ability to hit the ball at the right time. It is important to practice hitting the ball at the peak of its flight.</p> <p>Stamina: Stamina is essential for tennis, as it is a physically demanding sport. You need to be able to run, jump, and hit the ball for long periods of time.</p> | 10 |
| | <p>Fencing</p> <p>History of Fencing The earliest evidence of fencing dates back to ancient Egypt, Greece, and Rome.</p> <p>Fencing was used as a form of training for warfare and as a way to settle disputes. The modern sport of fencing developed in Italy in the 15th century.</p> <p>The first fencing competition was held in 1550 in Paris.</p> <p>Fencing became an Olympic sport in 1896, and it has been a part of every Games since then.</p> <p>Fencing is now a popular sport all over the world, and there are three main disciplines: foil, épée, and sabre.</p> <p>Fundamental Skills of Fencing</p> <p>Footwork: Footwork is essential in fencing, as it allows you to move quickly and efficiently around the piste. There are many different footwork drills that you can practice to improve your footwork.</p> <p>Blade work: Blade work is the ability to use the sword effectively. There are many different blade work techniques, and you need to practice them in order to become proficient.</p> <p>Parrying: Parrying is the ability to deflect an opponent's attack. There are many different parrying techniques, and you need to practice them in order to become proficient.</p> <p>Riposte: The riposte is the counterattack that follows a parry. It is an important skill in fencing, as it allows you to score points.</p> <p>Mental Focus: Mental focus is also an important skill in fencing, as it allows you to stay focused on the opponent and to avoid making mistakes</p> <p>5 Athletics</p> <p>History of Athletics The history of athletics can be traced back to the ancient Olympic Games, which were held in Greece from 776 BC to 393 AD. The original events included running, jumping, throwing, and wrestling.</p> | 10 |

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| | <p>The modern Olympic Games were revived in 1896, and athletics has been a part of every Game since then.</p> <p>Athletics is now a global sport, with competitions held at all levels, from local to international.</p> <p>Fundamental Skills of Athletics Running: Running is the most basic skill in athletics. It is the ability to move forward quickly and efficiently. There are many different types of running, including sprinting, distance running, and middle- distance running.</p> | |
| | <p>Jumping: Jumping is the ability to move upwards from the ground. There are many different types of jumping, including high jump, long jump, and triple jump.</p> <p>Throwing: Throwing is the ability to propel an object through the air. There are many different types of throwing, including shot put, discus throw, javelin throw, and hammer throw.</p> <p>Sprinting: Sprinting is a type of running that involves short bursts of speed. Sprinters need to be able to accelerate quickly and maintain their speed for a short period of time.</p> <p>Distance Running: Distance running is a type of running that involves running for long distances. Distance runners need to be able to pace themselves and maintain their energy levels for long periods of time.</p> <p>Middle-Distance Running: Middle-distance running is a type of running that involves running for distances between 800 meters and 1500 meters. Middle- distance runners need to be able to combine speed and endurance.</p> <p>High Jump: High jumping is a type of jumping that involves clearing a bar that is raised progressively higher. High jumpers need to be able to generate a lot of power in their legs and have good timing.</p> <p>Long Jump: Long jumping is a type of jumping that involves jumping as far as possible. Long jumpers need to have good speed and coordination.</p> <p>Triple Jump: Triple jumping is a type of jumping that involves jumping three times in a row. Triple jumpers need to have good speed, coordination, and power.</p> <p>Shot Put: Shot put is a type of throwing that involves throwing a heavy ball as far as possible. Shot putters need to have good upper body strength and technique.</p> <p>Discus Throw: Discus throw is a type of throwing that involves throwing a disc as far as possible. Discus throwers need to have good upper body strength and technique.</p> <p>Javelin Throw: Javelin throw is a type of throwing that involves throwing a spear as far as possible. Javelin throwers need to have good upper body strength and technique.</p> <p>Hammer Throw: Hammer throw is a type of throwing that involves throwing a heavy ball on a chain as far as possible. Hammer throwers need to have good upper body strength and technique.</p> | 10 |

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| | <p>Kho-Kho</p> <p>History of Kho-Kho Kho-Kho is a tag game that originated in India.</p> <p>It is believed to have originated in the Indian subcontinent over 4,000 years ago.</p> <p>The game is mentioned in the Sangam literature of Tamil Nadu, which dates back to the 3rd century BC.</p> <p>Kho-Kho was first played as a competitive sport in the Indian Olympic Games in 1938.</p> <p>It was included as a demonstration sport at the 1982 Asian Games in Delhi, and it became a full medal sport in the 1990 Asian Games in Beijing.</p> <p>Kho-Kho is now played in over 100 countries around the world.</p> <p>Fundamental Skills of Kho-Kho</p> <p>Touch: Touching an opponent is the most important skill in Kho-Kho. It is how raiders score points for their team. There are many different ways to touch an opponent, such as touching their arm, leg, or torso.</p> <p>Dive: Diving is a fundamental skill for all Kho-Kho players. It allows players to avoid being touched by the opponents. There are many different types of dives, such as front dive, side dive, and back dive.</p> <p>Stamina: Stamina is essential for all Kho-Kho players, as the game is very physically demanding. Players need to be able to run, jump, and dive for long periods of time.</p> <p>Agility: Agility is also important for Kho-Kho players, as they need to be able to change direction quickly and avoid being touched by the opponents.</p> <p>Teamwork: Teamwork is essential for Kho-Kho, as it is a team sport. Players need to be able to work together to score points and defend their territory</p> | 10 |
| | <p>Cricket</p> <p>History of Cricket The history of cricket can be traced back to the 16th century in England.</p> <p>The game is believed to have originated from a game called "stoolball", which was played by children in the 15th century.</p> <p>The first recorded cricket match was played in 1611 between two teams of Kentish cricketers.</p> <p>Cricket became a popular sport in England during the 18th century, and it was first played in Australia in 1826.</p> <p>Cricket became an international sport in the 19th century, and the first Test match was played between England and Australia in 1877.</p> <p>Cricket is now played in over 100 countries around the world.</p> <p>Fundamental Skills of Cricket</p> <p>Batting: Batting is the act of hitting the ball with a bat. It is the most important skill in cricket, as it is how runs are scored. There are many different batting techniques, such as the defensive technique and the attacking</p> | 10 |

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| | <p>technique.</p> <p>Bowling: Bowling is the act of delivering the ball to the batsman. There are many different bowling techniques, such as the fast bowling technique and the spin bowling technique.</p> <p>Fielding: Fielding is the act of catching the ball and preventing the batsman from scoring runs. It is an important skill for all cricketers, as it helps to prevent the other team from scoring runs.</p> <p>Running: Running is essential for scoring runs in cricket. Players need to be able to run quickly between the wickets to score runs.</p> <p>Stamina: Stamina is essential for all cricketers, as the game is very physically demanding. Players need to be able to run, jump, and field for long periods of time.</p> <p>Agility: Agility is also important for cricketers, as they need to be able to change direction quickly and avoid being run out.</p> <p>Teamwork: Teamwork is essential for cricket, as it is a team sport. Players need to be able to work together to score runs and prevent the other team from scoring runs.</p> | |
| | <p>Rifle Shooting</p> <p>History of Rifle Shooting The history of rifle shooting can be traced back to the 16th century in Europe. The first recorded rifle shooting competition was held in 1533 in Zurich, Switzerland. Rifle shooting became a popular sport in Europe during the 18th century, and it was first introduced to the United States in the 1770s. Rifle shooting became an Olympic sport in 1896, and it has been a part of every Games since then. Rifle shooting is now a popular sport all over the world.</p> <p>Fundamental Skills of Rifle Shooting</p> <p>Accuracy: Accuracy is the most important skill in rifle shooting. It is the ability to hit the target with the bullet. There are many different factors that affect accuracy, such as the stance, the grip, the breathing, and the trigger control.</p> <p>Consistency: Consistency is also important in rifle shooting. It is the ability to hit the target with the same accuracy shot after shot. There are many different factors that affect consistency, such as the mental focus and the physical preparation.</p> <p>Stance: The stance is the position of the body when shooting. It is important to have a stable stance in order to be accurate. There are many different stances that can be used, such as the standing stance, the kneeling stance, and the prone stance.</p> <p>Grip: The grip is the way that the rifle is held. It is important to have a firm grip in order to be accurate. There are many different grips that can be used, such as the weaver grip and the isosceles grip.</p> <p>Breathing: Breathing is important in rifle shooting because it can affect the accuracy</p> | 10 |

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| | <p>of the shot. It is important to breathe slowly and evenly before and after the shot. Trigger Control: Trigger control is the ability to pull the trigger smoothly and evenly. It is important to avoid jerking the trigger, as this can cause the shot to go off target.</p> | |
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MGMUNIVERSITY

Semester-II

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| Course code: APS21BSL103 Course name: Linear Algebra and Differential Equations Course category: Basic Science |
| Credits: 4 Teaching scheme: L-4 hrs/week Evaluation scheme: CA-60, ESE-40 |
| Duration of External Examination-2 Hrs |
| Pre-requisites: Pre-university mathematics. |
| Course Type: Basic Science Course |
| Course Objectives: |
| 1. This course aims to make the students become familiar with the basic concepts of linear algebra with a thorough understanding of vector spaces, linear transformations and matrix operations enhancing the students' ability to reason mathematically and able to apply this knowledge to many fields in engineering, statistics and computer science. |
| 2. To create and analyze mathematical models using differential equations |
| Course Outcomes: At the end of the course, the students will be able to - |
| CO1: Understand basic concepts such as vector spaces, linear dependence / independence of vectors, basis and linear maps. |
| CO2: Analyze and calculate eigen values, eigen vectors, rank nullity of a matrix / linear map. |
| CO3: Prove theorems; apply Gram-Schmidt process on inner product spaces, diagonalizable special matrices. |
| CO4: Solve ordinary differential equations analytically and numerically and apply these methods to solve engineering problems. |
| CO5: Find the solution of linear differential equations having their applications in mechanical and electrical systems. |

Contents –

| Unit | Content | Teaching hours |
|------|---|----------------|
| 1 | Matrices and Vector Spaces - Basic property of matrices, row operations and Gauss elimination, Inverse of a matrix. Basic concepts in linear algebra: vector spaces, subspaces, linear independence and dependence of vectors, bases, dimensions. Row and Column spaces, rank. Applications to systems of linear equations, Inverse transformation.. | 10 |
| 2 | Linear mappings and Diagonalization Linear mappings, representation by matrices, rank-nullity theorem, Diagonalization, Eigen values, Eigen vectors and their basic properties, Cayley Hamilton Theorem. | 10 |
| 3 | Inner Product Spaces and Quadratic Inner Product Spaces , Orthogonality, Gram-Schmidt process, Geometric Applications of Linear Transformation, Quadratic Forms: Positive Definiteness and applications | 10 |
| 4 | First order ordinary differential equations and Applications Exact , Linear ,Bernoulli and separable differential equations, Applications to Population growth/decay, Mixing problems, Draining tank/Torricelli's Law problems, Newton's Law of Cooling, Electric circuits, Falling bodies | 10 |

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| 5 | Ordinary differential equations of higher orders and Applications Linear differential equations with constant and variable coefficients, method of variation of parameters, Applications to mass spring systems and electrical circuits and Bending of beam and columns | 10 |
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| Text Books: 1. Introduction to Linear Algebra (2nd edition) by Serge Lang, Springer. | |
| 2. Elementary Linear Algebra (10th edition) by Howard Anton and Chris Corres, John Wiley and sons. | |
| 3. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005 | |
| 4. S. L. Ross, Differential Equations, 3rd Edition, Wiley India, 1984 | |

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| Reference Books: 1. Shanti Narayan, Differential Calculus, S. Chand & Co | |
| 2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, New York. | |
| 3. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi. | |
| 4. P. N. Wartikar, J. N. Wartikar, Applied Mathematics (Vol I & II), Pune Vidyarthi Griha Prakashan, Pune. | |
| 5. Differential Equations with Applications and Historical notes by George Simmons, Tata McGraw Hill publishing company Ltd, New Delhi | |
| 6. K.D Joshi, Calculus for Scientists and Engineers, CRC Press | |
| 7. Prasad and Reena Garg, Advanced Engineering Mathematics, Khanna Publishing Company Private Limited, New Delhi | |
| 8. Schaum's outlines of Linear Algebra (5th edition) by Seymour Lipschutz, Marc Lipson, McGraw-Hill Education (India) Private Limited, New Delhi | |

Semester-II

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| Course code: APS21BSL104 Course name: Engineering Chemistry Course category: Basic Science |
| Credits: 3 Teaching scheme: L-3hrs/week Evaluation scheme: CA-60, ESE-40 |
| Duration of External Examination- 2 Hrs |
| Pre-requisites: Fundamentals of basic chemistry. |
| Course Type: - Basic Science Course |
| Course Objectives: |
| 1. To impart a sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering branches. |
| 2. To impart a sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering branches. |
| 3. The objectives of the laboratory sessions are to enable the learners to get hands-on experience on the principles discussed in theory sessions and to recognize the applications of these concepts in engineering. |
| Course Outcomes: At the end of the course, the students will be able to - |
| CO1: Illustrate the water quality parameters, water softening processes and causes of hard water in industries. |
| CO2: Analyze Demonstrate a comprehensive understanding of advanced concepts in polymer chemistry |
| CO3: Apply fundamental concepts of corrosion science to solve problems arising in engineering applications |
| CO4: Interpret physical, chemical properties and applications of fuels and lubricants. |
| CO5: Describe the functions of batteries and applications of modern instrumental techniques like conductometry, pH metry, TLC, gas chromatography, UV-Visible and IR spectroscopy. |

Contents –

| Unit | Content | Teaching hours |
|------|---|----------------|
| 1 | Water Treatment - Natural sources of water, Impurities in water, Water quality parameters and its BIS standards, Hardness- Definition, Types, Estimation of hardness by EDTA method, Numerical based on hardness calculation, Disadvantages of hard water, Boiler troubles (causes, effect on boiler operation and methods of prevention), Internal and external treatments, Alkalinity and its determination, Water softening: Ion exchange process, Sewage water analysis- Dissolved oxygen (DO) and its determination, Biological oxygen demand (BOD), Chemical oxygen demand (COD) and their significance, Sewage water treatment. | 9 |
| 2 | Polymer Chemistry Introduction, Classification of polymers, Use and disposal of polymers, Polymerization and its types, Plastics and its types- Thermoplastic and thermosetting plastics, Preparation, properties and engineering applications of: PVC, PMMA, Bakelite and Epoxy resin, Molding constituents of plastics, Methods for molding of plastics into articles, Conducting polymers and Biopolymers (Introduction, types, examples and its applications. | 8 |

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| 3 | Corrosion and its Control Introduction, Types of corrosion, Mechanism of dry & wet corrosion, Factors influencing on corrosion – Nature of metal & Nature of environment. Methods of corrosion control, Cathodic and anodic protection, Use of Inhibitors, Protective Coatings: a) Metallic coatings: Types of coatings methods of applications, (hot dipping, cladding and electroplating), b) Nonmetallic coatings: Chemical conversion coatings, Powder coatings. | 8 |
| 4 | Fuels and Lubricants Fuels: Introduction, Classification of fuel, Calorific value of a fuel, Characteristics of a good fuel, Solid fuel- Coal, Various types of Coal, Analysis of coal- Proximate and Ultimate analysis, Numerical based on analysis of coals, Liquid fuel- Refining of Petroleum, Gaseous fuels- LPG and CNG. Lubricants: Introduction, Mechanism of lubrication, Classification of lubricants, Solid, Semi-solid and Liquid Lubricants, Properties of lubricants, Physical properties – Viscosity & Viscosity index, Surface tension, Flash and Fire point, Cloud and pour point. Chemical properties – Acid value, Saponification value, Aniline point. | 10 |
| 5 | Electrochemistry and Instrumental Methods of Chemical Analysis Electrochemistry: Introduction - Basic concepts: Conductance, Specific Conductance, Equivalent conductance, Molecular conductance, Effect of dilution on conductance, Cell constant. Battery: Primary & secondary batteries, Ni-Cd cell, Lithium-air battery, Fuel cell- H ₂ -O ₂ Cell. Instrumental Methods of Chemical Analysis: Basic principle, instrumentation and applications of pH metry, Conductometry, Thin layer chromatography, Gas Chromatography, Ultraviolet-Visible spectroscopy and Infra-Red Spectroscopy. | 10 |

Text Books: 1. Jain P.C & Jain Monica, Engineering Chemistry, Dhanpat Rai & Sons, Delhi

2. O. G. Palanna, Engineering Chemistry, Tata McGraw-Hill Publication, New Delhi.

3. S. S. Dara, A textbook of Engineering Chemistry, McGraw-Hill Publication, New Delhi.

4. Shashi Chawla, Engineering Chemistry, Dhanpat Rai and Co Education and Technical Publishers.

5. Shikha Agrawal, Engineering Chemistry- Fundamentals and Applications, Cambridge Publishers

Reference Books: 1. Barrow G.M., Physical Chemistry, McGraw-Hill Publication, New Delhi

2. Atkins, Physical Chemistry, OUP Oxford

3. Bhal & Tuli, Text book of Physical Chemistry, S. Chand & Company, New Delhi..

4. V. R. Gowariker, Polymer Science, New Age International Ltd

5. B. K. Sharma, Instrumental Methods of Chemical Analysis, Krishna Prakashan Medi

E-Resources: Name of the website/ E-Journals/ Online Videos

1. NPTEL Basic Courses Engineering Chemistry (<https://nptel.ac.in/courses/122/101/122101001/>)

2. <https://www.ncertbooks.guru/engineering-chemistry/>

3. Coursera Chemistry Courses (<https://www.coursera.org/browse/physical-science-and-engineering/chemistry?languages=en&page=2>)

4. "Introduction to Polymer Physics" NPTEL Course
(<https://www.youtube.com/playlist?list=PLwdnzlV3ogoXe67WsgE8f1fOIWcc5GKKS>)
5. "Introduction to Corrosion" NPTEL Course
(<https://www.youtube.com/playlist?list=PL8lylDWRkaW8BXestE4baRnN0699S11Lq>)
6. "Tribology & Lubrication" NPTEL Course (<https://www.youtube.com/playlist?list=PLLwnvFq-JAltJvWafEVU4gcUK27hEA7FD>)
7. "Electrochemistry" NPTEL Course
(https://www.youtube.com/playlist?list=PLVFqK_9GOGXnnriQpsn0z1Rss96Rh0vsm)
8. "Modern Instrumental Methods of Analysis" NPTEL Course
(<https://www.youtube.com/playlist?list=PL400CAFBA72E94CF8>)

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Semester-II

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| Course code: APS21ESL103 | Course name: Engineering Mechanics | Course category: ESC |
| Credits: 2 | Teaching scheme: L-2 hrs/week | Evaluation scheme: CA-60, ESE-40 |
| Duration of External Examination-2 Hrs | | |
| Pre-requisites: | | |
| Coordinate Geometry, Trigonometry, Sine & Cosine Rule, Unit Conversions. | | |
| Fundamentals of Physics | | |
| Course Type:- Basic Science Course | | |
| Course Objectives: | | |
| 1.This course aims to make the students become familiar with the basic concepts of linear algebra with a thorough understanding of vector spaces, linear transformations and matrix operations enhancing the students' ability to reason mathematically and able to apply this knowledge to many fields in engineering, statistics and computer science. | | |
| 2. To create and analyze mathematical models using differential equations | | |
| Course Outcomes: At the end of the course, the students will be able to - | | |
| CO1: Identify the force system for given conditions by applying the basics of mechanics. | | |
| CO2: Determine the unknown forces of different engineering systems by applying equilibrium conditions. | | |
| CO3: Apply the principles of friction and to locate Center of Gravity and find Moment of Inertia of plane lamina | | |
| CO4: Establish the relations between kinematic parameters for different types of motion. | | |
| CO5: Formulate the relevant equations for types of motion in kinetics. | | |

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| Unit | Content | Teaching hours |
|------|---|----------------|
| 1 | Force System Introduction to Mechanics, Laws of mechanics, Newton's Laws, Law of Parallelogram, Law of transmissibility, Characteristics of force, System of Forces, Method of resolution and composition moment of a force, Law of Moments, Varignon's Theorem, Problems on moment, Resultant, Equivalent force& couple, properties of couple. | 8 |
| 2 | Equilibrium Introduction to Equilibrium and its types, Equilibrant, Concept of FBD, Analytical conditions of equilibrium, Equilibrium of different force system, Lami's Theorem, Types of loads, beams and supports.. | 7 |
| 3 | Friction, Centre of Gravity and Moment of Inertia Friction: Introduction to friction, types and application, Laws of friction, Angle of friction, Angle of repose, Cone of friction, Problems on horizontal & inclined plane, block, and ladder. CG & MI: Centroid of regular and composite plane lamina, MI and its application, Perpendicular axis Theorem, Parallel Axis Theorem, Radius of Gyration, Problems on plane and composite lamina. | 8 |

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| 4 | Kinematics Introduction and classification of dynamics motion and its classification, Rectilinear Motion Equation of Motion, Motion curves, Curvilinear Motion, rectangular and tangential components of acceleration, Projectile Motion: General Equation of Projectile Motion. | 4 |
| 5 | Kinetics Applications Basic concepts and laws of motion, D'Alemberts Principle, Problems on rectilinear motion Curvilinear motion, Work, Energy Principle, Work Done by force, Work Done by weight force, Work Done by frictional force, Work Done by spring force, Kinetic and Potential energy of the particle Problems on all cases of Work Done, Principle of Impulse and Momentum, Principle of Conservation Momentum, Impact and its types, Coefficient of restitution, Problems on impact Problems on impulse and momentum, Kinetics of rigid body problems | 3 |

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| Text Books: 1 Beer, F.P and Johnston Jr. E.R., “Vector Mechanics for Engineers (In SI Units): Statics and Dynamics”, 8th Edition, Tata McGraw-Hill Publishing company, New Delhi (2004). | | |
| 2 Vela Murali, “Engineering Mechanics”, Oxford University Press (2010). | | |
| 3. S. Timoshenko, D. H. Young, “Engineering Mechanics”, McGraw Hill, 1995. | | |
| 4. Tayal A. K., “Engineering Mechanics”, Umesh Publications, 2010 | | |
| 5. Singer F. L., “Engineering Mechanics - Statics & Dynamics”, Harper and Row Pub. York. | | |
| 6. Khurmi R. S., “Engineering Mechanics”, S. Chand Publications, N. Delhi. | | |
| Reference Books: | | |
| 6. McLean, Nelson, "Engineering Mechanics", Schaum's outline Series, McGraw Hill Book Company, N. Delhi, Publication. | | |
| 7. Hibbeler, R.C and Ashok Gupta, “Engineering Mechanics: Statics and Dynamics”, 11th Edition, Pearson Education (2010). | | |
| 8. Bhavikatti, S.S and Rajashekarappa, K.G., “Engineering Mechanics”, New Age International (P) Limited Publishers, (1998). | | |
| 9. Irving H. Shames and Krishna Mohana Rao. G., “Engineering Mechanics – Statics and Dynamics”, 4th Edition, Pearson Education (2006). | | |
| 10. Rajasekaran Sand Sankarasubramanian G., “Engineering Mechanics Statics and Dynamics”, 3rd Edition, Vikas Publishing House Pvt. Ltd., (2005). | | |
| 11. Meriam J.L. and Kraige L.G., “ Engineering Mechanics- Statics - Volume 1, Dynamics- Volume 2”, Third Edition, John Wiley & Sons, (1993). | | |
| 12. Kumar, K.L., “Engineering Mechanics”, 3rd Revised Edition, Tata McGraw-Hill Publishing Company, New Delhi (2008). | | |
| E-Resources : | | |
| <ul style="list-style-type: none"> ● www.nptel.ac.in (Learning platform from IIT professors) ● http://www.asnu.com.au (For Engineering applications) ● www.discoveryforengineers.com (Investigating Discoveries) | | |

Semester-II

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| Course code: APS21ESL104 Course name: Building Programming logic in C Course category: ESC |
| Credits: 1 Teaching scheme: L-1 hr/week Evaluation scheme: CA–30, ESE–20 |
| Duration of Theory Exam: 1 Hr |
| Pre-requisites: Basic Knowledge of computers. |
| Course Objectives: |
| 1. To introduce the basic concepts of programming and the C language, including algorithms, program structure, data types, variables, constants, and tokens. |
| 2. To learn various operators, expressions, type casting, and input/output functions in C |
| 3. To understand decision-making statements, loops, and jump statements for controlling program flow. |
| 4. To learn arrays, strings, and functions, including user-defined and library functions, recursion, and variable scope. |
| 5. To understand structures, unions, and enums for creating user-defined data types in C |
| Course Outcomes: |
| After the completion of this course, students will be able to: |
| CO1: Write a simple C program. |
| CO2: Apply operators, expressions, and I/O functions to develop simple C programs. |
| CO3: Design and implement programs using control structures and loops for decision-making and iteration |
| CO4: Write C programs using arrays, strings, and functions to solve problems efficiently. |
| CO5: Write C programs using structures, unions, and enums to organize and manage complex data efficiently. |

Contents –

| Unit | Contents | Teaching Hours |
|------|--|----------------|
| 1 | Introduction To C Programming: Overview of C: History of C, Algorithm and Structure of C program. Keywords, Tokens, Data types, Constants, Literals and Variables. Operators and Expressions: Arithmetic operators, Relational operators, Logical operators, Expressions. Operator precedence and associativity, Type casting Console I/O Formatting: Formatted I/O, Unformatted I/O functions: getch(), getchar(), getche(), getc(), putc(), putchar() | 3 |
| 2 | Control Statements and Loops: Control statements: if, if-else, Nested if-else, conditional operators, switch and break, nested conditional branching statements, Looping Statements : while, do while, for, Nested loops, Jump Statements: break and continue, goto and label, exit function. | 3 |
| 3 | Array and String: Array: Array declaration, One and Two dimensional numeric and character arrays, Multidimensional arrays, operations on array. String: String declaration, initialization, string manipulation with library function, | 3 |

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| | Without library functions. | |
| 4 | <p>Functions: Functions: Definition, function components: Function arguments, return value, function prototype, function call statement, Types of function: Library Functions(math and character),User-defined Functions, Scope and lifetime of variable, Call by value and call by reference. Function using arrays, function with command line argument. Recursive function.</p> | 3 |
| 5 | <p>Structure and Union: Structure: Basics, declaring structure and structure variable, typedef statement, array of structure, array within structure, Nested structure; passing structure to function, function returning structure. Union: basics, declaring union and union variable, Difference between Structure and Union Enum: declaring enum and enum variable.</p> | 3 |

Text Books:

1. Programming in ANSI C, E. Balagurusamy, Tata McGraw-Hill, Third Edition.
2. Let Us C, Yashwant Kanetkar, Infinity Science Press, Eighth Edition.
3. Mastering C, K. R. Venugopal, Tata McGraw-Hill.

Reference Books

- The C Programming Language, Brian W. Kernighan & Dennis M. Ritchie, Prentice Hall, 2nd Edition.
- Applications Programming in ANSI C, R. Johnsonbaugh & Martin Kalin, Macmillan, 2nd Edition.
- The Spirit of C, Mullish Cooper, Jaico Publishing House.
- How to Solve It by Computer, R. G. Dromey, Pearson Education

Semester-II

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| Course code: APS21PCL101 Course name: Basics of Electrical and Electronics Engineering Course category: PCC |
| Credits: 2 Teaching scheme: L-2 hrs/week Evaluation scheme: CA-60, ESE-40 |
| Duration of External Examination- 2 Hrs |
| Pre-requisites: Pre-university mathematics |
| Course Type:- Professional Core Course |
| Course Objectives: |
| 1. To understand Electrical circuits and classify circuits as per laws. |
| 2. To understand Magnetic circuits and apply them in transformer devices. |
| 3. To understand the working principle of semiconductor devices. |
| 4. To understand the basics and applications of digital electronics. |
| Course Outcomes: After completion of this course, students will be able to: |
| CO1: Solve simple DC and single-phase AC circuits using KCL, KVL and network theorems. |
| CO2: Explain fundamentals of magnetic circuit and transformers. |
| CO3: Explain the working of diodes and transistors. |
| CO4: Explain the importance of number systems and logic gates. |

Contents –

| Unit | Content | Teaching Hours |
|------|---|----------------|
| 1 | Electrical Circuits Voltage and current sources: independent, dependent, ideal and practical; V-I relationships of resistor, inductor, mutual inductor and capacitor; Kirchhoff's laws, mesh and nodal analysis, superposition, Thevenin's, maximum power transfer theorems. Alternating voltages and currents, RMS, average, maximum values, Single Phase RL, RC, RLC series circuits, Power in AC circuits, Power Factor, Three phase balanced systems | 7 |
| 2 | Magnetic Circuits & Transformer Concepts of m.m.f, flux, flux density, reluctance, permeability and field strength, their units and relationship, right hand thumb rule and cork screw rule, Faraday's law of electromagnetic induction, Fleming's right-hand rule statically and dynamically induced EMF's self and mutual inductance coefficient of coupling, energy stored in magnetic circuit, Single phase transformers: Construction, principle of working, e.m.f equations. | 8 |
| 3 | Semiconductor Devices Introduction to Semiconductors, P-type and N-type Semiconductors, P- N Junction Diode: Construction and working, V-I characteristics of Diode, Reverse breakdown mechanism. Special purpose diodes: Zener Diode, Light Emitting Diode (LED) and PhotoDiode - Construction, working and applications. Bipolar Junction Transistor (BJT): types, construction and regions of operation. | 7 |

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|---|--|---|
| 4 | Digital Electronics: Binary, Decimal, Octal, Hexadecimal, number systems and their inter-conversion, Binary Addition, Binary Subtraction, One's complement, Two's complement, Logic Gates: Basic, Universal and Special. Boolean Laws (AND, OR, NOT) and DeMorgan's theorems, Realization of basic logic gates using universal gates. | 8 |
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|---|
| Text Books: 1 V. N. Mittal and Arvind Mittal, "Basic Electrical Engineering" McGraw Hill |
| 2. Edward Hughes, "Electrical Technology," Pearson Education |
| 3. Electrical Technology Vol.1 & Vol.4 by B. L. Theraja & A. K. Theraja, S. Chand Publications. |
| 4. "Electronics Devices and Circuits", S Salivahanan, McGraw Hill Publications |
| 5. "Modern Digital Electronics", R.P. Jain, McGraw Hill Publications |
| Reference Books: 1. Vincent Del Toro, "Electrical engineering Fundamentals", PHI second edition 2011 1. Robert Boylestad, "Electronics Devices and Circuits Theory", Pearson Education India 2. "Electronics Devices and Circuits Theory", Robert Boylestad, Pearson Education India. |
| E-Resources: a. Online course on NPTEL "Basic Electrical Engineering" b. NPTEL Course on "Introduction to Basic Electronics", Prof. T.S. Natarajan, IIT Madras. c. NPTEL Course on "Digital Electronic Circuits", Prof. Goutam Saha, IIT Kharagpur. |

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Semester-II

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|--|--|-----------------------------|
| Course code: APS21IKL101 | Course name: Indian Knowledge Systems | Course category: IKS |
| Credits: 2 Teaching scheme: L-2 hrs/week Evaluation scheme: CA-60, ESE-40 | | |
| Duration of External Examination- 2 Hrs | | |
| Pre-requisites: NIL | | |
| Course Objectives: | | |
| The objective of this course is | | |
| 1. To make students understand foundational concepts in IKS for science, engineering and technology. | | |
| 2. To explore ancient Indian pursuits and accomplishments in the various domains of engineering | | |
| Course Outcomes: At the end of the course, the students will be able to - | | |
| CO1: Familiarise with key components of the IKS & develop appreciation for Indian philosophical systems | | |
| CO2: Understand key features of the Indian Numeral System, units of measurement and the framework for establishing the right knowledge. | | |
| CO3: Appreciate the unique & specific contributions of ancient Indian mathematicians in Arithmetic, Geometry & Trigonometry. | | |
| CO4: Develop awareness about engineering & technology heritage of India and understand ancient Indian contributions in various engineering domains. | | |

| Unit | Content | Teaching Hours |
|------|---|----------------|
| 1 | Introduction to IKS: Importance of ancient knowledge, defining IKS, Classification framework for IKS, Historicity of IKS, Indian philosophical systems, Vedic schools of philosophy(Sankhy and yoga, Nyaya and Vaisesika, Purva- Mimamsa and Vedanta), Non- Vedic philosophical systems (Jain, Bauddha and Carvaka) , Wisdom through the ages: Issues of interest in the Puranas, Itihasa as a source of wisdom (Uniqueness of the two epics), Nitisastras. | 08 |
| 2 | Foundational Concepts for Science and Technology: Number system in India, salient features of the Indian numeral system. Measurements for Time, Distance and weight. The knowledge triangle, Prameya- a Vaisesikan approach to Physical Reality, Pramana - The means of valid knowledge, Framework for establishing valid knowledge. | 07 |
| 3 | Science in IKS: Mathematics: Great mathematicians and their contributions. Arithmetic (square of a number, square root, series and progressions). Geometry (Property of right angled triangle in Sulba- sutras, value of tt). Trigonometry, Algebra, Binary Mathematics and combinatorial problems in Chandah- Sastra of Pingala. | 08 |

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|---|---|----|
| 4 | Engineering and Technology in IKS: The Indian Science and Technology Heritage, Mining and ore extraction. Metals and metal working technology. Iron and Steel in India, Lost wax casting of idols and artefacts, apparatuses used for extraction of metallic components. Literary sources for Science and Technology, Physical Structures in India, Irrigation & Water Management, Dyes and Painting Technology, Shipbuilding. | 08 |
|---|---|----|

Text Books:

1. Mahadevan B., Bhat Vinayak Rajat & Nagendra Pavana R.N. "Introduction to Indian Knowledge System Concepts and Applications" PHI, 2023.
2. Jha Amit "Traditional Knowledge System in India" Atlantic Publishers and Distributors (P) Ltd, 2023
3. Chauhan Bhag Chand "IKS: The Knowledge system of Bharata" Garuda Prakashan, 2023
4. Bag A.K., "Mathematics in Ancient and Medieval India" Chaukhambha Orientalia, 1979
5. Sengupta Nirmal, "Traditional Knowledge in Modern India" Springer, 2019

Reference Books:

1. Bag A.K., "History of Technology in India, Vol. I" Indian National Science Academy, 1997
2. Kumar Alok, "Ancient Hindu Science" Jaico Publishing House, 2019
3. Datta B and Singh A.N. "History of Hindu Mathematics: Parts I and II" Asia Publishing House, 1962
4. Kapoor Kapil, Singh Awdhesh Kumar "Indian Knowledge Systems Vol. -I & II" D.K. Print World Ltd, 2005

E-Resources:

https://www.youtube.com/watch?v=-cBd6JYPWtY&list=PLRfu94TCePTtWtu0x145H_63WgoeYickE
https://www.youtube.com/watch?v=yvj5ROYbP2E&list=PLRfu94TCePTtLuEYSzmJXNYK_EnDSvY3N
<https://iksindia.org/book-list.php>

Semester-II

| Course code: APS21VSP102 Course name: Workshop Practices Course category: VSEC | |
|---|---|
| Credits: 2 Teaching scheme: P-4 hrs/week Evaluation scheme: TW-60, PR-40 | |
| Pre-requisites: Pre-university English. | |
| Course Type: Vocational Skill Enhancement Course. | |
| Course Objectives: | |
| 1. To know about the different carpentry tools and perform various carpentry operations to complete the job | |
| 2. To understand different welding tools, joints, defects and perform welding operation to complete useful article/job. | |
| 3. To learn various types of pipes, plumbing tools, operations and perform thread cutting on GI pipes. | |
| 4. To know different sheet metal tools, operations, applications and perform various operations to complete job. | |
| Course Outcomes: On completion of the course, the student should be able to: | |
| CO1: Perform basic carpentry operation on wood and prepare carpentry article. | |
| CO2: Perform welding processes and prepare welding article by performing various welding operations. | |
| CO3: Use plumbing tools, processes and perform threading on GI pipe. | |
| CO4: Use sheet metal tools, processes and prepare sheet metal article . | |
| Contents – | |
| Unit | Contents |
| 1 | Carpentry Shop Carpentry shop: Types of woods, tools, joints, operations, applications, safety measures etc. Job: Exercises on wood involving operations marking, sawing, chiselling, planning, grooving etc to make useful wooden article/ job e.g. Wooden Trophies, Showpiece articles, Stools etc |
| 2 | Welding Shop Welding Shop: Types of welding, welding joints, tools, welding defects, applications, safety measures etc. Job: Exercise in Arc welding to make useful articles like Grills, Stools, Tree Guards, Flower pot stand, Shoe rack, Bag Stand, Showpiece Articles from Scrap etc. |
| 3 | Plumbing Shop Plumbing shop: Study of types of pipe, pipe joints, operations, applications, safety measures etc. Job: Prepare threading on GI pipe to make useful items like Nipple, Pipe joints etc. |
| 4 | Sheet Metal Shop: Sheet Metal Shop: Sheet metal tools, operations, applications, safety measures etc. Job: Making an utility item using G I sheet involving development, marking, cutting , bending, spot welding/riveting Parts like i) Tray, ii) Funnel etc.. |

Text Books: 1 Hazra and Chaudhary, Workshop Technology-I, Media promoters & Publisher private limited.

2. Hazra and Chaudhary, Workshop Technology-II, Media promoters & Publisher private limited.

Reference Books: 1.K. C. John, Mechanical Workshop Practice, Prentice Hall Publication, New Delhi, 2010.

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Semester-II

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|---|--|
| Course code: APS21BSP102 Course name: Engineering Chemistry Lab Course category: Basic Science | |
| Credits: 1 Teaching scheme: P-2 hrs/week Evaluation scheme: TW-30, PR-20 | |
| Pre-requisites: Pre-university English. | |
| Course Type: Vocational Skill Enhancement Course. | |
| Lab Objectives: | |
| 1. To know about the different carpentry tools and perform various carpentry operations to complete the job | |
| 2. To understand different welding tools, joints, defects and perform welding operation to complete useful article/job. | |
| 3. To learn various types of pipes, plumbing tools, operations and perform thread cutting on GI pipes. | |
| 4. To know different sheet metal tools, operations, applications and perform various operations to complete job. | |
| Lab Outcomes: Upon completion of the Lab Experiments, the students should able to, | |
| LO1: Perform the experiments as well as accurately record the readings and analyze the results of such experiments | |
| LO2: Estimate the impurities present in water using titrimetric and instrumental methods. | |
| LO3: Employ the basic techniques used in chemistry laboratory for analysis such as volumetric titrations, complexometric titrations, Conductometry, pH metry, viscometer, Stalagmometer and TLC. | |
| Unit | Content |
| 1 | Determination of hardness of water sample by EDTA method. |
| 2 | Determination of chloride content in water sample by precipitation titration method |
| 3 | Determination of dissolved oxygen in water by Iodometric method |
| 4 | Determination of percentage purity of bleaching powder |
| 5 | Determination of strength of acid / base using pH metric titration |
| 6 | Determination of strength of acid / base using conductometric titration. |
| 7 | To determine the cell constant of the given conductivity cell. |
| 8 | To determine relative surface tension of unknown liquids by using stalagmometer. |
| 9 | To determine the viscosity of unknown liquids by using Ostwald / Redwood viscometer. |
| 10 | To determine acidity of given water sample. |
| 11 | Determination of acid value of an oil sample. |
| 12 | Determination of saponification number of an oil sample |
| 13 | To determine alkalinity of given water sample. |

| | |
|----|--|
| 14 | Preparation of phenol- formaldehyde / urea-formaldehyde resin. |
| 15 | To find out the Rf value of given sample by thin layer chromatography. |
| 16 | To separate the given mixture using thin layer chromatography. |
| 17 | Proximate analysis of coal (moisture content, volatile matter, ash content). |
| 18 | To study factors influencing on rate of electrochemical corrosion. |
| 19 | To determine flash and fire point of given oil by Pensky-Marten flash point apparatus. |
| 20 | To determine cloud and pour point of lubricating oil. |

Reference Books:

1. A Text book on Experiments and Calculations in Engineering Chemistry by Dr. S. S. Dara, S Chand Publication.
2. Laboratory manual on Engineering Chemistry by S. K. Bhasin & Sudha Rani, Dhanpat Rai Publishing Company.
3. Engineering Chemistry with Laboratory Experiments by M. S. Kaurav, Asia-Pacific the holdings Private Ltd.

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Semester-II

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|---|
| Course code: APS21ESP104 Course name: Engineering Mechanics Lab Course category: ESC |
| Credits: 1 Teaching scheme: P-2hrs/week Evaluation scheme: TW-30, PR-20 |
| Lab Outcomes: |
| LO1: Describe the working principle of mechanics and correlate them with day to day engineering applications |
| LO2: Formulate and solve mechanics problems based on law of moments, conditions of equilibrium. |
| LO3: Verify theoretical concepts through analytical, experimental and graphical methods. |

List of Experiments –

| Unit | Content |
|-------------|--|
| 1 | Verification of law of the Machine using Screw jack. |
| 2 | Polygon law of coplanar forces. |
| 3 | Bell crank lever. |
| 4 | Lami's theorem. |
| 5 | Support reactions for beam. |
| 6 | Problems on beam reaction by graphics statics method. |
| 7 | Inclined plane (to determine coefficient of friction). |
| 8 | Centroid of irregular shaped bodies. |
| 9 | Determine center of gravity for composite sections. |
| 10 | Determine moment of inertia for composite sections. |
| 11 | Moment of Inertia of fly wheel. |
| 12 | Simple / compound pendulum. |

Semester-II

| |
|---|
| Course code: APS21ESP105 Course name: Building Programming logic in C Lab Course category: ESC |
| Credits: 1 Teaching scheme: P-2 Hrs/week Evaluation scheme: TW–30, PR–20 |
| Lab Objectives: |
| 1.To introduce the basic concepts of programming and the C language, including algorithms, program structure, data types, variables, constants, and tokens. |
| 2.To learn various operators, expressions, type casting, and input/output functions in C. |
| 3.To understand decision-making statements, loops, and jump statements for controlling program flow. |
| 4.To learn arrays, strings, and functions, including user-defined and library functions, recursion, and variable scope. |
| 5.To understand structures, unions, and enums for creating user-defined data types in C |
| Lab Outcomes: After the completion of this course, students will be able to: |
| LO1: Write a simple C program. |
| LO2: Apply operators, expressions, and I/O functions to develop simple C programs. |
| LO3: Design and implement programs using control structures and loops for decision-making and iteration. |
| LO4: Write C programs using arrays, strings, and functions to solve problems efficiently |
| LO5: Write C programs using structures, unions, and enums to organize and manage complex data efficiently |

List of Practicals

| Unit | List of Practicals | Teaching hours |
|------|---|----------------|
| 1 | <ol style="list-style-type: none"> 1. Write a C program to find sum and average of three numbers. 2. Write a C program to find the sum of individual digits of a given positive integer. | 02 |
| 2 | <ol style="list-style-type: none"> 1. Write a C program to check whether the given number is perfect or not. 2. Write a C program to check whether the given number is strong or not. | 02 |
| 3 | <ol style="list-style-type: none"> 1. Write a C program to generate the first n terms of the Fibonacci sequence. 2. Write a C program to generate prime numbers between 1 to n. | 02 |
| 4 | <ol style="list-style-type: none"> 1. Write a C program to find the roots of a quadratic equation. 2. Write a C program to perform arithmetic operations using switch statement. | 02 |
| 5 | <ol style="list-style-type: none"> 1. Write a C program to find the largest and smallest number in a list of integers. 2. Write a C program to sort the array in ascending order. | 02 |
| 6 | <ol style="list-style-type: none"> 1. Write a C program to find whether the given matrix is symmetric or not. 2. Write a C program to perform addition of two matrices. | 02 |
| 7 | <ul style="list-style-type: none"> • Write a C program that displays the position or index in the main string S where the sub-string T begins, or -1 if S doesn't contain T. • Write a C program to count the number of lines, words, and characters in a given text. | 02 |

| | | |
|----|--|----|
| 8 | <ol style="list-style-type: none">1. Write a C program to swap the values of two variables using:<ol style="list-style-type: none">i) call by valueii) call by reference2. Write a C program using user-defined functions to determine whether the given string is palindrome or not.3. Write a C program using function to perform multiplication of two matrices. | 02 |
| 9 | <ul style="list-style-type: none">• Write a C program to use function to insert a sub-string into a given main string from a given position.• Write a C program to find factorial of a given integer using recursive function.• Write C program to find GCD of two integers by using recursive function | 02 |
| 10 | <ol style="list-style-type: none">1. Write a C program to calculate total and percentage marks of a student using structure. | 02 |

References:

- “College of Engineering, Pune“
- “University of Mumbai“

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Semester-II

| Course code: APS21PCP101 Course name: Basics of Electrical and Electronics Engineering Lab | |
|--|---|
| Course category: PCC | |
| Credits: 1 Teaching scheme: P-2 hrs/week Evaluation scheme TW-30, PR-20 | |
| Lab Objectives | |
| 1. Understand the DC circuit as per KCL & KVL and AC circuits as per theorems. | |
| 2. Understand the working of a single-phase transformer. | |
| 3. Understand the working of electronic instruments, components and logic gates . | |
| 4. Understand the working of a PN junction diode. | |
| Course Outcomes: After completion of this lab, students will be able to: | |
| | |
| CO1: Use of KCL & KVL to solve DC circuits as well as use of AC theorems to solve AC circuits | |
| CO2: Demonstrate a single-phase transformer & it's working. | |
| CO3: Use electronic instruments, working of electronic components and logics gates | |
| Contents – | |
| Unit | Content |
| 1 | Verification of Loop Analysis and Nodal Analysis for DC Circuits |
| 2 | Verification of Thevenin's Theorem for DC Circuits |
| 3 | Verification of Maximum Power Transfer Theorem for DC Circuits. |
| 4 | Determination of Voltage, Current and Power Flow in Single Phase AC Circuit including R, L and C with Combination |
| 5 | Determination of Magnetic Material Terms and EMF Induction. |
| 6 | Demonstration and Determination of Single-Phase Transformer Terms like Voltage Ratio and Turns Ratio. |
| 7 | Study of Electronic Instruments |
| 8 | Study of Electronic Components. |
| 9 | Study of Logic Gates. |
| 10 | Study of V-I characteristics of a PN Junction Diode using V-Lab. |
| 11 | Study of Rectifier Circuits using Every Circuit simulation application. |
| 12 | Study of working and troubleshooting of Smartphone, Computer & TV (Case Study Approach). |

Semester-II

| Course code: MGM82CCP104 Course name: National Service Scheme (NSS) Course category: CCA | | |
|---|--|----------------|
| Credits: 2 Teaching scheme: P-4 hrs/week Evaluation scheme: TW-30, PR-20 | | |
| Pre-requisites: Pre-university English. | | |
| Course Type:- CCA | | |
| Course Objectives: | | |
| Contents – | | |
| Unit | Content | Teaching hours |
| 1 | <p>Introduction to National Service Scheme (NSS) Emergence of NSS in India (Historical Background) and its development. Organizational Structure of National Service Scheme from National Level to College Level. Objectives of National Service Scheme (NSS) National Service Scheme (NSS) – Symbol and its meaning Symbol of NSS and its meaning Motto of National Service Scheme (NSS) Various prayers, inspirational songs to be used in NSS Programme.</p> | 8 |
| 2 | <p>National Service Scheme (NSS) Regular Activities Guidelines of Distribution of working hours or academic year. Classification of Regular Activities in the Society 1. Rural 2. Urban 3. Campus Need base with association Associations in NSS Activities 4. Govt. Organization 5. NGO Scope for Innovation (Self-Generated)</p> | 8 |
| 3 | <p>Social Issues in India Concept of Society, Community (Steps involved in evaluation of society) <ul style="list-style-type: none"> ● Features of Indian Society ● Communities in India Basic Social Issues in India Family System, Division of labor, Cast System in India, Gender Issues, Regional Imbalance.</p> | 7 |

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|---|--|---|
| 4 | <p>Indian Constitution and Social Justice</p> <p>Indian Constitution</p> <ol style="list-style-type: none"> 1. Preamble 2. Structure 3. Features 4. Fundamental Rights & Duties <p>Social Justice</p> <ol style="list-style-type: none"> 5. Social Justice – the Concept and its features <p>Contribution for Social Justice – Mahatma Jyotiba Phule, Dr. Babasaheb Ambedkar, Shahu Maharaj.</p> | 7 |
|---|--|---|

References:

3. National Service Scheme Manual (Revised) 2006, Government of India, Ministry of Youth Affairs and Sports, New Delhi.
4. University of Mumbai National Service Scheme Manual 2009.
5. Avhan Chancellor's Brigade-NSS Wing, Training camp on Disaster Preparedness Guidelines, March 2012.
6. Rashtriya Seva Yojana Sankalpana- Prof. Dr. Sankay Chakane, Dr. Pramod Pabrekar, Diamond Publication, Pune.
7. National Service Scheme Manual for NSS District Coordinators, National Service Scheme Cell, Dept. of Higher and Technical Education, Mantralaya,
8. Annual report of National Service Scheme (NSS) published by Dept. of Higher and Technical Education, Mantralaya,
9. NSS Cell, Dept. of Higher and Technical Education, Mantralaya, UTKARSHA- Socio and cultural guidelines.

Semester-II

| | | |
|---|--------------------------------------|---|
| Course code: MGM73CCP204 Course name: Fine Art Course category: CCA | | |
| Credits: 2 | Teaching scheme: P-4 hrs/week | Evaluation scheme: CA-30, ESE-20 |
| Prerequisites: Nil | | |
| Course Objectives: | | |
| <ol style="list-style-type: none"> 1. Students will be able to draw clean lines. 2. Students will be able to explore shading from light to dark. 3. Students will be able to draw perspective drawing. 4. Students will be able to sketch landscape and portrait drawing. | | |
| Course Outcomes: After completion of this course, students will be able to: | | |
| <p>CO1: Pay attention to core details in visualization.</p> <p>CO2: Represent on paper what they have observed in terms of 3 and 2 dimensional objects and light and dark play of perspective.</p> <p>CO3: Draw clean lines and neat figures which will gradually help the in fashion illustrations.</p> | | |

List of Practicals:

| Sr. No. | Contents | Lab Hours |
|----------------|--|------------------|
| 1 | Explore pencil as medium for drawing and exploration of different types of grades of pencils. Lines - Freeing hand movement by practicing various ways to draw lines (wavy/zigzag/diagonal/vertical/horizontal) | 8 |
| 2 | 3D objects with Shading: <ul style="list-style-type: none"> • Exploring and sketching 3D objects with Shading/Hatching - Light to Dark (HB/2B/3B/4B/5B/6B) • Space Division - Studying of proportion. Perspectives- Coin / Box / Landscape. | 7 |
| 3 | Sill Drawing: <ul style="list-style-type: none"> • Introduction to landscape and portrait drawing. • Still drawing (perspective drawing of man- made object) | 7 |
| 4 | Exploration of color mediums: <ul style="list-style-type: none"> • Exploration of color mediums (chalk/ink/poster/pastels/water) • Landscape perspective of natural and man- made, charcoal rendering. • Still drawing of man- made and natural object by rendering and defining perspective. Ambedkar, Shahu Maharaj. | 8 |

Reference Books:

1. Mellem, Jeff; Sketching people & Live drawing basics.
2. Belleville- Van Stone, France; Sketch: The Non-Artist's guide to inspiration technique drawing life

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Semester-II

| | | |
|--|--------------------------------------|---|
| Course code: MGM73CCP204 Course name: Visual Art Course category: CCA | | |
| Credits: 2 | Teaching scheme: P-4 hrs/week | Evaluation scheme: CA-30, ESE-20 |
| Course Type:- Professional Core Course | | |
| Course Objectives: | | |
| 1.To understand the actual work process in the advertising market. 2. To understand the growth and necessity of advertising in the market. | | |
| Course Outcomes: After completion of this course, students will be able to: | | |
| CO1 :Able to choose a topic for campaign design. CO2: Understand that how campaign design is necessary CO3: Understand the actual work process in advertising market. CO4: Understand the process of designing. | | |

List of Practicals:

| Sr. No | Name of Practical | Lab Hours |
|--------|---|-----------|
| 1 | Topic for campaign design • It should be either product, service or social topic. • Mind mapping | 8 |
| 2 | Different types of media • New digital medias • Use of elective subject in campaign • Software use in designing | 11 |
| 3 | Sill Drawing Final layout • Printing in actual size media • Presentation on ppt of the topic includes artwork with rough work | 11 |

Suggested Tutorial / Practical:

Assignment I: Students will be required to submit a mind map.

Assignment II: Students will be required to submit a list of media selection.

Assignment III: Students will be required to submit different medias in digital form

Assignment IV: Students will be required to submit different medias in print form. Teaching Methods and learning activities-

- Lecture with power point projections
- Demonstration with practical
- Documentaries and Presentation
- Use of different medium and art form to make a new concept of work

Assessment Strategies

Classroom lecture

Power point presentations

Group discussion
digital form

Reference Books:

- Advertising Campaign Design Just the Essentials - By Robyn Blakeman
- Campaign Strategies and Message Design: A Practitioner's Guide from Start to Finish - by Mary Moffitt (Author)
- Student should refer the previous knowledge about medias and refer the internet for help.

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Semester –III

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| Course Code: ITY23PCL201 Course Name: Discrete Structures and Applications Course Category: PCC |
| Credits: 2 Teaching Scheme: L- 2 Hrs/week Evaluation Scheme: CA-60, ESE-40 |
| Duration of Theory Exam: 2 Hrs |
| Pre-requisites: Basic Mathematics |
| Course Objectives: This course will enable students to |
| This course will enable students to |
| 1. Use standard notations to Write English sentences for logical expressions and vice-versa. |
| 2. develop a foundation of set theory concepts, notation and applications. |
| 3. Understand logic, basic counting principles, function and relation. |
| Course Outcomes: At the end of the course, the students will be able to - |
| CO1 Verify the correctness of an argument using symbolic logic and truth tables. |
| CO2 Construct mathematical arguments using logical connectives and quantifiers. |
| CO3 Construct proofs using mathematical induction And Solve problems involving recurrence relations and generating functions |
| CO4 Perform operations on discrete structures such as sets, functions, relation. |

Contents–

| Unit | Content | Teaching Hours |
|------|--|----------------|
| 1 | Mathematical Thinking Variables - Logical Form and Logical Equivalence, Conditional Statements, Valid and Invalid Arguments, Application: Digital Logic Circuits | 6 |
| 2 | Logic of Quantified Statements -Predicates and Quantified Statements, Statements with Multiple Quantifiers, Arguments with Quantified Statements. | 6 |
| 3 | Sequences, Mathematical Induction- Sequences, Mathematical Induction I, Mathematical Induction II, Strong Mathematical Induction and the Well-Ordering Principle for the Integers, Application: Correctness of Algorithms: Assertions, Loop Variants. | 6 |
| 4 | Set Theory & Function - Set Theory, Definitions and the Element Method of Proof, Properties of Sets, Disproofs: Disproving an Alleged Set Property. Functions: Functions Defined on General Sets, One-to-One and Onto, Inverse Functions, Composition of Functions. | 6 |

| | | |
|----------|--|----------|
| 5 | <p>Relations- Relations on Sets, Reflexivity, Symmetry, and Transitivity, Equivalence Relations: The Relation Induced by a Partition, Definition of an Equivalence Relation. Modular Arithmetic with Applications to Cryptography: Properties of Congruence Modulo n, Modular Arithmetic.</p> <p>Partial Order Relations: Antisymmetry, Partial Order Relations, Lexicographic Order, Hasse Diagrams, Partially and Totally Order Sets.</p> | 6 |
|----------|--|----------|

Text Books:

1. Susanna S. Epp, "Discrete Mathematics with Applications" 4th Edition, 2010.
2. K. H. Rosen, "Discrete Mathematics and Its Applications", Tata McGraw Hill Publication, 7 th Edition, 2012.
3. B. Kolman, R. Busby, S. Ross, "Discrete Mathematical Structures", Pearson Education, 6 th Edition, 2009.
4. R. K. Bisht, H. S. Dhami, "Discrete Mathematics", Oxford University Press, 2015.

Reference Books:

1. Kenneth H Rosen, "Discrete Mathematics and its Applications" .7th Edition, 2011
2. C L Liu, "Elements of Discrete Mathematics" 4th Edition, July 2017.
3. Norman L Biggs, "Discrete Mathematics", 2nd Edition, December 2002
4. Kenneth Bogart and Robert L Drysdale, "Discrete Mathematics for Computer Science", 1st Edition, Sept.2005
5. R Krishna Kumar, "Discrete Mathematics",1st Edition, 2005.

Online Resources:

- 1.NPTEL course on Discrete Mathematics.

Semester –III

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|--|
| Course Code: ITY23PCL202 Course Name: Data Structures Course Category: PCC |
| Credits: 2 Teaching Scheme: L- 2 Hrs/week Evaluation Scheme: CA-60, ESE-40 |
| Duration of Theory Exam: 2 Hrs |
| Pre-requisites: Fundamentals of programming logic |
| Course Objectives: This course will enable students to |
| 1.Build foundation in computer programming |
| 2.Develop programming skills |
| 3.Apply programming constructs to implement different data structures. |
| Course Outcomes: At the end of the course, the students will be able to - |
| CO1 Apply knowledge of basic programming constructs to design algorithms and programs. |
| CO2. Demonstrate functioning of linear data structures (stack, queue and linked list) and apply them in required applications. |
| CO3. Write neat code by selecting appropriate data structure and demonstrate a working solution for a given problem. |
| CO4 Analyze performance of algorithms by determining time and space complexity. |
| CO5. Distinguish between linear and non-linear data structures and determine their applicability. |
| CO6. Analyze possible solutions for solving a given problem and select the most efficient one. (for eg, Sorting and Searching) |

Contents–

| Unit | Content | Teaching Hours |
|------|---|----------------|
| 1 | Introduction to Data Structures Data, Data Structure, operations on data structures, Types of data structures: linear and non-linear Algorithm, characteristics of an algorithm, Pseudo-Code. Performance measurement of an algorithm, time and space complexity. Asymptotic notations. Iterative and Recursive algorithms. | 7 |
| 2 | Linear Data Structures: Stack and Queue Stack, Operations on a stack, Mathematical expressions: Infix, Prefix and Postfix, Conversion of expression from one form to other. Applications of a stack: Evaluation of | 7 |

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| | postfix expression.Queue, Operations on a queue, Circular queue, Double ended queue Priority queue, Application of queue. | |
| 3 | Linear Data Structures: Linked List Static and dynamic memory allocation, Linked list, Types of linked-list: Singly, doubly and circular. Operations on linked list: Create, Insert, Search, Delete etc. Stack and queue implementation using linked list. Application of linked list: Addition of polynomials. | 8 |
| 4 | Non-Linear Data Structures Trees: Binary tree, Binary search tree, Binary tree representation, Operations on binary search trees. Tree traversals, Balanced search tree: AVL Graphs: Graphs, Graph representation, Graph Traversals, Minimum spanning tree, Minimum spanning tree algorithms: Kruskal, Prim's | 8 |

Text Books:

1. E. Horowitz, D. Mehta, S. Sahni, "Fundamentals of Data Structures in C++", Silicon Press, 2nd Edition, 2008.
2. Goodrich, Tamassia, "Data Structures and Algorithms in Java", Wiley publication, 6th Edition, 2014.
3. Seymour Lipschutz, "Data Structures", Schaum's Outlines, McGraw Hill Education, 1 February 2014.
4. E. Balagurusamy. "C Programming and Data Structures", Publisher Tata McGraw - Hill Education, Edition: 4th, 2008

Reference Books:

1. T. H. Cormen, C. E. Leiserson, R. L. Rivest, C. Stein, "Introduction to Algorithms", MIT Press, 3rd Edition, 2009.
2. Y. Langsam, M. J. Augenstein and A. M. Tanenbaum, "Data structures using Java", Pearson Education, 2003.
3. Thomas Cormen, Introduction to Algorithms, PHI Publication, 2nd Edition, 2002.

Semester –III

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|---|
| Course Code: ITY23PCL203 Course Name: Object Oriented Programming Course Category: PCC |
| Credits: 2 Teaching Scheme: L- 2 Hrs/week Evaluation Scheme: CA-60, ESE-40 |
| Duration of Theory Exam: 2 Hrs |
| Pre-requisites: Logic Building ability |
| Course Objectives: This course will enable students to |
| 1.To understand Object oriented concepts like data abstraction, encapsulation, etc. |
| 2.To solve real world scenarios using a top down approach. |
| 3.To understand various c++ programming constructs. |
| Course Outcomes: At the end of the course, the students will be able to - |
| CO1. Explain Object-Oriented Programming Paradigm |
| CO2. Understand the storage concepts in a simple program |
| CO3. Develop programs using basic concepts of object oriented languages i.e. objects, encapsulation, data hiding etc. |
| CO4. Construct programs using advanced concepts of object oriented languages i.e. associations, packages, interfaces, exception handling etc. |
| CO5. Apply knowledge behind exception handling in c++ |

Contents–

| Unit | Content | Teaching Hours |
|------|---|----------------|
| 1 | Fundamentals of Object Oriented Programming- Object-Oriented Programming Paradigm: Benefits, Applications, Object-Oriented Systems Development, Object-Oriented Design: Class design and algorithm. Tokens, Data types, Operators, Expressions, and Control structures, Array, Functions, Structures and Unions, Class and Objects, specifying a class, Defining member functions, Private member functions, Static data and member functions, Arrays of objects, Friend functions. | 6 |

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|---|---|---|
| 2 | Constructors and Destructors - Constructor, Parameterized constructors, Multiple constructors in a class, Copy constructors, Dynamic constructors, Destructor. Programming for class diagrams and relationships. | 6 |
| 3 | Inheritance - Single inheritance, Multilevel inheritance, Multiple inheritance, Hierarchical inheritance, Hybrid inheritance, Virtual base classes, Abstract classes. | 6 |
| 4 | Polymorphism and Exception handling - Operator overloading, Function overloading, Virtual functions, pure virtual functions, Types of exceptions, Catching 10 exceptions, Multiple catching, Nested try statements, Uncaught exceptions, Throw and throws, Built-in exceptions, Creating exception subclasses, Using exceptions. | 6 |
| 5 | Files and Streams - Working with Files: Classes for file stream operations and I/O stream operation, Opening and closing a file, Detecting end-of-file, More about Open(): File Modes, Sequential input and output operations. | 6 |

Text Books:

1. Robert Lafore, "Object Oriented Programming in C++", Pearson Education, 4th Edition, 2008.
2. E. Balagurusamy, "Object Oriented Programming with C++", Tata McGraw Hill Publication, 6th Edition, 2013

Reference Books:

1. J. R. Hubbard, "Programming with C++: Schaum's Outlines", Tata McGraw-Hill publication, 2005.
2. P. J. Deitel, H.M. Deitel, "C++ How to Program", Pearson Education, 9th Edition, 2016.

Semester –III

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|---|
| Course Code: ITY23PCL204 Course Name: Network Communications and Computing Course Category: PCC |
| Credits: 2 Teaching Scheme: L- 2 Hrs/week Evaluation Scheme: CA-60, ESE-40 |
| Duration of Theory Exam: 2 Hrs |
| Pre-requisites: Computer Basics |
| Course Objectives: This course will enable students |
| 1. To Understand the working of layers in OSI model |
| 2. To Understand internet protocol. |
| 3. To Understand IPV4 addresses. |
| Course Outcomes: At the end of the course, the students will be able to - |
| CO1. Compare intermediate devices such as hub,switch,router. |
| CO2. Compare OSI and TCP/IP models. |
| CO3. Compare network types. |

Contents–

| Unit | Content | Teaching Hours |
|------|--|----------------|
| 1 | OSI Model and the TCP/IP Protocol Suite - Introduction: Data Communications, Networks, Network Types, Network Models, Internet Standards and Administrations, Network Models: Protocol layering, TCP/ IP Protocol Suite, OSI Model, Layers in the TCP/IP Protocol Suite, Addressing: Physical Addresses, Logical Addresses, Port Addresses, Application-Specific Addresses, Wired Local Area Networks, Addressing, Ethernet Evolution | 6 |
| 2 | Physical and Data Link Layer - Transmission media (cables, wireless,Signal representation (digital/analog)Network interfaces (NICs),Standards and protocols (e.g., Ethernet, Wi-Fi) Error detection and correction (CRC, checksum),Media access control (MAC addressing),Flow control and error handling,,Protocols (e.g., Ethernet II, PPP), , Multiple Access Protocols, Wi MAX, Cellular Telephony | 6 |
| 3 | Network Layer- Network layer design issues, Network Layer Services, Packet Switching, Network Layer Performance, IPv4 addresses, Address space, classful and classless addressing, Internet protocol, ICMPv4, Routing Algorithms: Distance Vector Routing, Link | 6 |

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|---|--|---|
| | State Routing, Path Vector Routing, Routing in Internet: RIP, OSPF, BGP, Congestion control and QoS.SMTP, MIME, POP3, Webmail, FTP, TELNET. | |
| 4 | Transport and Session Layer - Transport Layer: Services, Addressing, Connection establishment, Connection release, Flow control and buffering, Multiplexing, TCP features, connection, Congestion Control, Real Time Transport protocol (RTP), UDP for wireless, Stream Control Transmission Protocol (SCTP), Differentiated services,Dynamic Host Control Protocol (DHCP), Simple Network Management Protocol (SNMP) Session Layer: Session establishment and termination, Dialog control (synchronization),Security services (e.g., authentication) Presentation Layer:Data encryption and decryption | 6 |
| 5 | Application and Presentation Layer - Presentation Layer:Data encryption and decryption , Network services (e.g., email, file transfer, web browsing),Application protocols (e.g., HTTP, FTP, SMTP, SNMP, DNS). | 6 |

Text Books:

1. Fourauzan B., "Data Communications and Networking", 5thEdition, Tata McGraw-Hill, Publications, ISBN: 0 -07 -058408 ,2006
2. Andrew S. Tenenbaum,"Computer Networks",PHI, ISBN 81-203-2175-8 2006
3. Kurose, Rose, "Internet Protocol", Pearson, ISBN-10: 0132856204, 2020
4. William Stalling,"Data and Computer Communication" ,Pearson, 8th edition, ISBN: 0-13-243310-9 , 2007

Reference Books:

1. Kurose, Ross "Computer Networking a Top Down Approach Featuring the Internet", 6th edition (March 5, 2012), 2.Pearson , ISBN-10: 0132856204.
2. Andrew S. Tenenbaum, "Computer Networks", 5th Edition, PHI, ISBN 81-23- 2175-8.

Semester –III

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| Course Code: ITY23PCP202 Course Name: Data Structure LAB Course Category: PCC |
| Credits: 1 Teaching Scheme: P- 2 Hrs/Week Evaluation Scheme: TW: 30, PR: 20 |
| Pre-requisites: Fundamentals of programming logic |
| Lab Objectives: This course will enable students to |
| 1. Build foundation in computer programming |
| 2. Develop programming skills |
| 3. Apply programming constructs to implement different data structures. |
| Lab Outcomes: At the end of the course, the students will be able to - |
| LO1. Apply knowledge of basic programming constructs to design algorithms and programs. |
| LO2. Demonstrate functioning of linear data structures (stack, queue and linked list) and apply them in required applications. |
| LO3. Write neat code by selecting appropriate data structure and demonstrate a working solution for a given problem. |
| LO4. Analyze performance of algorithms by determining time and space complexity. |
| LO5. Distinguish between linear and non-linear data structures and determine their applicability. |
| LO6. Analyze possible solutions for solving a given problem and select the most efficient one. (for eg, Sorting and Searching) |

List of Experiments:

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| 1. Implementation of Arrays <ol style="list-style-type: none"> a. Write a program to accept N elements in an array and find the sum of it. b. Write a program to accept N elements in an array and find even/odd numbers from it. c. Write a program to find the given element present in the array or not. d. Write a program to accept N elements in two arrays and store sum of them in the third array. e. Write a program for multiplication of two matrices |
| 2. Implementation of Stack <ol style="list-style-type: none"> a. Perform operations on stack using array b. Evaluation of postfix expression using stack c. Reverse a string using array |
| 3. Implementation of Simple Queue <ol style="list-style-type: none"> a. Perform operations using array |

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| 4. Implementation of Circular Queue |
| 5. Implementation of Singly Linked List a. Create a singly linked list and perform insert delete operations on it for all conditions b. Reverse a singly linked list c. Implementation of stack using singly linked list |
| 6. Implementation of Singly Linked List a. Create a singly linked list and perform insert delete operations on it for all conditions b. Reverse a singly linked list c. Implementation of stack using singly linked list d. Implementation of queue using singly linked list |
| 7. Implementation of Doubly Linked List a. Create a doubly linked list and perform insert delete operations on it for all conditions b. Reverse a singly linked list c. Implementation of stack using singly linked list d. Implementation of queue using singly linked list |
| 8. Implementation of Circular Singly Linked List |
| 9. Implementation of Circular Doubly Linked List |
| 10. Implementation of Binary Search Tree and Traversing using linked list |

Semester –III

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|---|
| Course Code: ITY23PCP203 Course Name: Object Oriented Programming Lab Course Category: PCC |
| Credits: 1 Teaching Scheme: P-2 Hrs/week Evaluation Scheme: TW- 30, PR- 20 |
| Pre-requisites: Basic understanding of C programming language |
| Lab Objectives: This course will enable students to |
| 1. To understand the concept of inheritance in C++ and its various forms. |
| 1. To explore advanced features of C++ such as inline functions, operator overloading, and function overloading. |
| 2. To master file handling techniques in C++ for reading from and writing to files. |
| Lab Outcomes: At the end of the course, the students will be able to - |
| LO1. Implement single, multiple, multilevel, and hierarchical inheritance in C++ programs, demonstrating proficiency in object-oriented programming principles. |
| LO 2. Utilize inline functions, operator overloading, and function overloading effectively in C++ programs to improve code efficiency, readability, and maintainability. |
| LO3. Students will be proficient in performing file operations in C++ programs, including naming files, opening files, writing data into files, reading data from files, and closing files, ensuring data integrity and security. |

List of Experiments

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| 1. To write a C++ program to find the sum of the given variables using a function with default arguments. |
| 2. Write a C++ program to display Names, Roll No., and grades of 3 students who have appeared in the examination. Declare the class of name, roll no., and grade. Create an array of class objects. Read and display the contents of the array. |
| 3. Given that an EMPLOYEE class contains following members: data members: Employee number, Employee name, Basic, DA, IT, Net Salary and print data members |
| 4. Write C++ programs that illustrate how the following forms of inheritance are supported: a)Single inheritance b)Multiple inheritance |
| 5. Write C++ programs that illustrate how the following forms of inheritance are supported: a) Multiple inheritance b)Multilevel inheritance d)Hierarchical inheritance |
| 6. To write C++ program to implement an inline function. |

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| 7. Write a Program to Generate Fibonacci Series using Constructor to Initialize the Data Members. |
| 8. Write a Program to Demonstrate the i) Operator Overloading. ii) Function Overloading. |
| 9. Write a Program to Naming a file, Opening a file, Writing data into the file, Reading data from the file, Closing a file. |
| 10. Write a Program to Demonstrate the Catching of All Exceptions. |

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Semester –III

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| Course Code: ITY23FPJ201 Course Name: Web Technology Course Category : FP |
| Credits: 2 Teaching Scheme: P- 4 Hrs/week Evaluation Scheme: TW-50 |
| Pre-requisites: Fundamentals of programming logic |
| Lab Objectives: This course will enable students to |
| 1. To introduce HTML and CSS for web development |
| 2. To familiarize students with JavaScript fundamentals and its application in web development. |
| 3. To teach responsive web design using Bootstrap framework. |
| 4. To provide an introduction to back-end development using PHP and MySQL. |
| 5. To introduce students to front-end development with ReactJS and state management with Redux. |
| Lab Outcomes: At the end of the course, the students will be able to - |
| LO 1. Students will be proficient in creating visually appealing and responsive web interfaces using HTML, CSS, and Bootstrap, enhancing user experience across different devices and screen sizes. |
| LO.2 Students will demonstrate competency in client-side scripting using JavaScript, enabling them to create dynamic and interactive web pages, handle form submissions, and manage events effectively. |
| LO3. Students will gain the skills necessary to develop modern, interactive web applications using ReactJS, including understanding component-based architecture, managing application state with Redux, and implementing routing for single-page applications. |

Contents–

| Unit | Content | Teaching Hours |
|------|---|----------------|
| 1 | Introduction To HTML,CSS - Introduction to HTML: Basic designing elements, components attributes (Structured tags, Block level tags, meta tags, formatting, style, lists, images, tables, frames, audio, video), HTML5 Introduction to CSS Fundamentals of CSS, Inline CSS, external CSS and embedded CSS, Overview and Features of CSS3, creating a webpage with CSS, Media Query, Introduction to responsive website. | 6 |
| 2 | Introduction To JavaScript - JavaScript: Fundamentals of JS , Functions , Arrays, Array Methods, Object object methods, Errors, Debugging. Working on Forms, Event handling. | 6 |

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| 3 | Front-End UI development with Bootstrap - Bootstrap Overview: Basics of Bootstrap, setting up a web project using Bootstrap. Responsive design and the Bootstrap grid system, Bootstrap CSS Components(Navigation and Navigation bar, buttons, forms, tables, cards, images and media, tags, alerts and progress bars) , Bootstrap Javascript Components (pills and tabbed navigation, collapse, accordion, scrollspy, affix, tooltips, popovers, modals and the carousel | 6 |
| 4 | Introduction to Back-End Technology- PHP: Introduction to PHP, Features of PHP, Basics of PHP, Syntax, Variable, Functions, Array, Object oriented PHP with MySQL and Forms | 6 |
| 5 | Introduction to React JS - ReactJS – Overview, Features, Limitations, ReactJS - Environment Setup, ReactJS – JSX, ReactJS – Components. React Router and Single Page Applications ReactJS – State, ReactJS - Props Overview, ReactJS - Props Validation, ReactJS - Component API, ReactJS - Component Lifecycle React Forms, Flow Architecture and Introduction to Redux Working with forms, different components in the forms, basics of Redux, installation, core concepts, ecosystem. | 6 |

List of Experiments

1. Introduction to HTML: Demonstration of all the necessary tags in HTML, HTML5
2. Introduction to CSS: CSS, Inline, external and embedded CSS, Overview and Features of CSS3, media query.
3. Create a website for an organization/personal portfolio using HTML and CSS
4. Introduction to Javascript: Demonstration of Variables, Operators, Arithmetic, Assignment, Data Types, Functions, Objects, Scope, Events, Strings, String Methods, Numbers, Number Methods, Math, Random, Dates, Date Formats, Date Methods, Arrays, Array Methods, Array Sort, Booleans, Comparisons, Conditions, Switch, Loop For, Loop While, Break
5. Demonstration using javascript
 - a. Create an application for temperature conversion degree Celsius to Fahrenheit
 - b. Create an application for currency conversion rupee to dollar
 - c. Dropdown events based on options (UG->UG courses , PG->PG Courses)
6. Introduction to Bootstrap, CDM, grid system, typography , components
7. Create a theme using bootstrap components
8. Introduction to PHP: Installation of XAAMP, WAAMP, APACHE,MySQL Workbench, syntax of PHP
9. Create a web page with form and perform crud operation through PHP using MySQL
10. Introduction to React : Create a static webpage using ReactJS.

Semester –III

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| Course Code: ITY23HSL201 Course Name: Business Management and Financial Accounting Course Category: EEMC |
| Credits: 2 Teaching Scheme: L- 2 Hrs/week Evaluation Scheme: CA-60, ESE-40 |
| Duration of Theory Exam: 2 Hrs |
| Pre-requisites: Basic Management |
| Course Objectives: This course will enable students to |
| 1. To enable students to describe the estimated cash flows from a project, including operating, net working capital, and capital spending. |
| 1. To provide the students to understand the related information of business Finance. Students can prepare basic financial statements. |
| 2. To enable students to prepare final financial statements. |
| Course Outcomes: At the end of the course, the students will be able to - |
| CO1: Analyze the risk and return of alternative sources of financing. |
| CO2. Estimate cash flows from a project, including operating, net working capital, and capital spending. |
| CO3. Define basic terminology used in finance and accounts. |
| CO4. Prepare Financial Statements. |

Contents–

| Unit | Content | Teaching Hours |
|------|--|----------------|
| 1 | Introduction to Business Management - Aims, Objective And Function of Business Management, Principles of Management, Concept of business finance, Goals & objectives of financial management, Sources of financing-Long Term financing and Short Term Financing | 7 |
| 2 | Business Capital Management- Concept of business working Capital, significance, types. Adequacy of working capital, Factors affecting working capital needs, financing approaches for working capital, Methods of forecasting, working capital requirements | 8 |
| 3 | Basics of Financial Accounting - Meaning, Scope and importance of Financial Accounting. Financial Accounting - concepts and conventions, classification of accounts, | 7 |

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| | Rules and principles governing Double Entry Book-keeping system, Meaning, Preparation of Journal, Ledger, Cash book & Trial balance. | |
| 4 | Financial Statement Preparation and analysis- Preparation of financial statements. Profit & Loss Account, Balance Sheet, Ratio Analysis. | 8 |

Text Books:

1. Financial Management by Khan & Jain, Text, Problem & Cases, Tata McGraw Hill Publication 5th Edition.
2. Tulsian Financial Management by Dr.P.C.Tulsian, S Chand Publication 5th Edition.
3. Taxman's Financial Management by Ravi M. Kishore, Taxmann 2017 Edition.

Reference Books:

1. A Textbook of Financial, Cost & Management Accounting by Dr.P.Periasamy, Himalaya Publishing House.
2. Fundamentals of Financial Management by Bhabhtosh Banerjee, PHI publication, 2nd Edition.

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Semester –IV

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|---|
| Course Code: ITY23PCL251 Course Name: Statistics Course Category: PCC |
| Credits: 2 Teaching Scheme: L- 2 Hrs/week Evaluation Scheme: CA-60, ESE-40 |
| Duration of Theory Exam: 2 Hrs |
| Pre-requisites: |
| |
| Course Objectives: This course will enable students to |
| 1.To learn Probability Theory and probability distribution |
| 2.To know the significance of Regression and correlation |
| 3.To learn Time series analysis |
| Course Outcomes: At the end of the course, the students will be able to - |
| CO1.Understand Probability Theory and distribution |
| CO2: Understand and apply appropriate regression and correlation methods and interpret results. |
| CO3: perform Time series analysis |

Contents–

| Unit | Content | Teaching Hours |
|------|---|----------------|
| 1 | Theory of probability- Axiomatic approach of probability, Random variable, Probability distributions, PMF, PDF, Binomial distribution, Poisson distribution, Normal distribution | 6 |
| 2 | Correlation- Introduction, Types of correlation, Correlation and causation, Methods of studying correlation, Karl Pearson's correlation coefficient, Spearman's rank correlation, Properties of Karl Pearson's correlation coefficient, Properties of Spearman's rank correlation coefficient, Probable errors, Examples | 6 |
| 3 | Regression- Introduction, Linear and non-linear regression, Lines of regression, Derivation of regression lines of y on x and x on y, Angle between the regression lines, Coefficients of regression, Properties of regression coefficient, Examples. | 6 |
| 4 | Introduction to Sampling Theory- Introduction, Universe or Population, parameters and statistics of sampling Distributions, Principles of Sampling, Limitations of Sampling, Errors in Statistics | 6 |
| 5 | Time Series Analysis- Introduction, Components of Time Series, Analysis of Time Series, Mathematical model for Time Series, Measurement of Trend. | 6 |

Text Books:

1. S. C. Gupta, "Fundamentals of Statistics", 46th Edition, Himalaya Publishing House, 1 May 2018.
2. G. V. Kumbhojkar, "Probability and Random Processes", 14th Edition, C. Jamnadas

Reference Books:

1. Jay Devore "Probability and Statistics for engineers and sciences" 8th edition, Cengage Learning

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Semester –IV

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|---|
| Course Code: ITY23PCL252 Course Name: Programming in JAVA Course Category: PCC |
| Credits: 2 Teaching Scheme: L- 2 Hrs/week Evaluation Scheme: CA-60, ESE-40 |
| Duration of Theory Exam: 2 Hrs |
| Pre-requisites: Fundamentals of programming logic |
| Course Objectives: This course will enable students to |
| 1. To enable the students to understand the core principles of the Object-Oriented Language |
| 2. To understand the concept of packages and applet programming |
| 3. To understand the concept of Multi-threading |
| 4. To understand the concept of graphic programming |
| 5. Introduce the students to database connectivity |
| Course Outcomes: At the end of the course, the students will be able to - |
| CO1. Apply Object Oriented concepts to develop programs in Java. |
| CO2. Develop programs using packages and applet programming. |
| CO3. Develop programs using Inheritance, Interfaces. Multithreading. |
| CO4. Develop programs using graphic programming |
| CO5. Develop applications using databases. |

Contents–

| Unit | Content | Teaching Hours |
|-------------|---|-----------------------|
| 1 | Introduction to JAVA- Fundamentals of Object Oriented Programming, Overview of JAVA, Data types, Operators and expressions, Control Statements and Loops, Arrays, Strings Collection Framework: Array List class, Linked List class, List Iterator interface, Hash Set classes, Vector | 8 |
| 2 | Object Oriented Programming - Classes and Objects, methods, method overloading, method overriding, static methods, visibility controls, Constructors, Inheritance, Interface, Packages | 8 |

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|---|--|---|
| 3 | <p>Multithreading and Exception Handling Thread - MultiThreading: Creating threads, Extending Thread Class, Stopping and Blocking a thread, Life cycle of a thread, using thread method, Thread exceptions, Implementing the Runnable interface, Inter-thread communication.</p> <p>Managing Errors and Exceptions: Types of errors, Exceptions, Syntax of exception handling code, Multiple catch statements, throwing your own exception, Using exceptions for debugging</p> | 8 |
| 4 | <p>SWING and JDBC - Introduction to AWT, Graphics classes, Introduction to swing, difference between awt and swing, Components of swing</p> <p>Introduction to JDBC, connectivity with database (MySQL, SQLServer, etc)</p> | 8 |

Text Books:

1. E. Balagurusamy, "Programming with Java – A Primer", Tata – McGraw-Hill Publication, 1998
2. Steven Holzner et al. "Java 2 Programming", Black Book, Dreamtech Press, 2006
3. Herbert Schildt, "Java 2: The Complete Reference", 2002
4. Ken Arnold, James Gosling, David Holmes, "THE Java™ Programming Language", Addison Wesley Professional, 2000

Reference Books:

1. H.M. Deitel, P.J. Deitel, "Java - How to Program", PHI Publication
2. Bruce Eckel, "Thinking in Java", PHI Publication.
3. Patric Naughton, Michael Morrison, "The Java Handbook", McGraw Hill Publication.
4. Tim Lindholm, Frank Yellin, Bill Joy, Kathi Walrath, "The Java Virtual Machine Specification", Addison Wesley Publication.

Online Resources:

1. https://www.java.com/en/download/help/index_using.xml
2. <https://docs.oracle.com/javase/6/tutorial/doc/>

Semester –IV

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| Course Code: ITY23PCL253 Course Name: Digital Logic Design Course Category: PCC |
| Credits: 2 Teaching Scheme: L- 2 Hrs/week Evaluation Scheme: CA-60, ESE-40 |
| Duration of Theory Exam: 2 Hrs |
| Pre-requisites: nil |
| Course Objectives: This course will enable students to |
| 1. To train the students on fundamentals of digital logic design. |
| 2. To train the students for minimization of digital circuits. |
| 3. To study combinational and sequential Logic Design (Multiplexer, De-multiplexers). |
| Course Outcomes: At the end of the course, the students will be able to - |
| CO1. Perform binary arithmetic; explain logic gates, universal gates, K-map. |
| CO2. Design different Combinational and Sequential Logic circuits. |
| CO3. Demonstrate the working of flip-flops. |

Contents–

| Unit | Content | Teaching Hours |
|------|--|----------------|
| 1 | Number Systems and Codes - Number systems: Binary, Octal, Hexadecimal number systems, Binary arithmetic, 2's Complement Arithmetic, Codes: Binary code, Excess-3 code, grey code, Error detecting and correcting codes. | 6 |
| 2 | Combinational Logic Design - Introduction, Standard Representation of Logic functions, Karnaugh Map Representation of Logic functions, Simplification of Logic functions using K Map, Minimization of logic functions, Don't-care Conditions, Design Examples, Five and Six Variable K Maps, Quine – McCluskey Minimization Technique | 6 |
| 3 | Combinational Functions - Introduction, Multiplexers and their use in Combinational Logic Design, Demultiplexers/ Decoders and their use in Combinational Logic Design, Digital Comparators | 6 |
| 4 | FLIP-FLOPS -Introduction, A 1 Bit Memory Cell, Clocked S-R FLIP FLOP, J-K FLIP FLOP, D and T FLIP FLOP, Excitation table of FLIP FLOP, Conversion from one type of FLIP FLOP to Another Type | 6 |

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|---|--|---|
| 5 | Introduction to Sequential Logic Design - Introduction, Registers, Applications of Shift registers, Ripple and synchronous counters | 6 |
|---|--|---|

Text Books:

1. R.P. Jain, "Modern Digital Electronics", Tata McGraw Hill Publication, 4th Edition, 2010.
2. M. M. Mano, "Digital Logic and Computer Design", Prentice Hall of India Publication, 4th Edition, 2006.

Reference Books:

1. D. P. Leach, A. P. Malvino, G. Saha, "Digital Principles and Applications", Tata McGraw Hill Publication, 8th Edition, 1993.
2. Comer, "Digital Logic & State Machine Design", Oxford Universities Press, 3rd Edition, 2014

Online Resources:

1. NPTEL videos

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Semester –IV

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|---|
| Course Code: ITY23PCL254 Course Name: Digital Image Processing Course Category: PCC |
| Credits: 2 Teaching Scheme: L- 2 Hrs/week Evaluation Scheme: CA-60, ESE-40 |
| Duration of Theory Exam: 2 Hrs |
| Pre-requisites: 1.Elements of visual perception. 2.Basic linear algebra and Fourier transform Set theory |
| Course Objectives: This course will enable students to |
| 1. Understand fundamental digital image processing steps and mathematical models in digital image |
| 2.Apply enhancement restoration segmentation image processing algorithm. |
| 3.Develop time and frequency domain techniques for image enhancement. |
| Course Outcomes: At the end of the course, the students will be able to - |
| CO1. Introduce basic image processing techniques. |
| CO2. Learn image enhancement techniques in spatial and frequency domain. |
| CO3. Apply different Segmentation techniques on Image |
| CO4. Explore Morphological Image Processing and Object Representation and description. |

Contents–

| Unit | Content | Teaching Hours |
|------|---|----------------|
| 1 | Fundamentals of Image Processing - Introduction & Applications, Components of Image Processing System, Fundamentals Steps in Image Processing, Image sensing and acquisition, simple image formation, Image sampling and Quantization, Representing digital pixels, Some basic relationships like Neighbours, Connectivity, Distance Measures between pixels Image quality, Introduction to colour image – RGB and HSI Models | 7 |
| 2 | Image Enhancement - Image Enhancement in the Spatial and Frequency Domain: Image enhancement by point processing, Image enhancement by neighborhood processing, Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic and Logic operations, Basics of Spatial Filters, Smoothing and Sharpening Spatial Filters, Combining Spatial Enhancement Methods. Introduction to Fourier Transform and the frequency Domain, Smoothing and Sharpening Frequency Domain Filters | 8 |

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| 3 | Segmentation - segmentation and threshold function, Different algorithms in thresholding, Line detection, Edge detection, Edge linking by graph search method, Hough transform, Region based segmentation, Matching. | 8 |
| 4 | Morphological operations- Morphological-dilation and erosion, opening and closing, Hit/ miss transforms, Representation Boundary descriptors, Regional descriptors. | 7 |

Text Books:

1. Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing", Third Edition, Pearson Education,2007
2. S. Jayaraman, S. Esakkirajan, T. Veerakumar "Digital Image Processing", McGraw Hill Publication,2014
3. Anil K. Jain, "Fundamentals of Digital Image Processing", Pearson 2004

Reference Books:

1. B. ChaB. Chanda, Dutta Majumdar, "Digital Image Processing and Analysis", PHI,2000.
2. Ze-Nian Li and Mark S. Drew, "Fundamentals of Multimedia", PHI 2011.
3. Murat Tekalp, "Digital Video Processing", Pearson, 2010.
4. John W. Woods, "Multidimensional Signal, Image and Video Processing", Academic Press 2012.
5. Gonzalez, R. C., & Woods, R. E. (2017). Digital Image Processing. 4th edition. Pearson Education

Semester –IV

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| Course Code: ITY23PCP252 Course Name: Programming in JAVA LAB Course Category: PCC |
| Credits: 1 Teaching Scheme: P-2 Hrs/week Evaluation Scheme: TW-30, PR-20 |
| Pre-requisites: Basic Programming |
| Lab Objectives: This course will enable students to |
| 1. To enable the students to understand the core principles of the Object-Oriented Language |
| 2. To understand the concept of packages and applet programming |
| 3. To understand the concept of Multi-threading |
| 4. To understand the concept of graphic programming |
| 5. Introduce the students to database connectivity |
| Lab Outcomes: At the end of the course, the students will be able to - |
| LO1. Apply Object Oriented concepts to develop programs in Java. |
| LO2. Develop programs using packages and applet programming. |
| LO3. Develop programs using Inheritance, Interfaces. Multithreading. |
| LO4. Develop programs using graphic programming |
| LO5. Develop applications using databases. |

List of Experiments**Unit I:****Introduction to Java****Aim: To study the working environment of java.**

1. Wap to print your Biodata?

2. Wap to add, subtract, divide, multiply two numbers using command line arguments? Wap to print your Biodata using command line arguments?

Aim: To study Decision Control structures and loop control structures in java

1. Wap to find out the Factorial of a number using For loop, While loop, Do while loop.

2. Wap to find out the square root of a number without using any library function?

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| 3. Wap to find out whether a number is palindrome or not? |
| 4. Write a program to print the kth digit from last. e.g. input 23617 and k=4 output 3. |
| 5. Write a program to find the sum of all digits. Input 23617 output 2+3+6+1+7=19. |
| Aim: To study Arrays in java |
| 1. Find the smallest and largest number in an array. |
| 2. Count even numbers in an array. |
| 3. Count occurrence of a given number in an array. |

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| Aim: To study interface in java |
| 1. WAP to find out the factorial of a number using the interface ? |
| 2. WAP to find out the greatest among three numbers using the interface? |
| 3. WAP to find out gcd and lcm using the interface ? |
| 4. WAP to find out area and perimeter of rectangle using interface ? |
| Aim: To study packages in JAVA |
| WAP to check whether a number is palindrome or not using a package ? |
| WAP to find out square root of a number without using sqrt or pow function and use packages |
| WAP to check whether a number is prime or not using a package ? |

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| Unit II: |
| Object Oriented Programming |
| Aim: To study classes and objects in JAVA |
| 1. WAP to find out the area of a triangle having three sides using class? |
| 2. WAP to find out the volume of a box using class ? |
| 3. WAP to find out the area and perimeter of a rectangle ? |
| 4. WAP to insert 10 no into stack using push operation and delete 2 elements using pop and display rest using class ? |
| Aim: To study methods, method overloading , constructors in java |
| 1. WAP to find out the area of a triangle,rectangle,square and circle using method overloading and constructor overloading. |
| 2. Write a JAVA program which contains a method square() such that square(3) returns 9, square(0.2) returns 0.04. |
| 3. Write a JAVA program which contains a method cube() such that cube(3) returns 27, cube(0.2) returns 0.008. |
| 4. Write a JAVA program which contains a method fun() such that fun(x) returns x and fun(x,y) returns $x^2 + y^2$ (where x and y are integers). |
| 5. Write a JAVA program which contains a method fun() such that fun(x) returns x and fun(x,y) returns $x + y$ and fun(x,y,z) returns $x*y*z$. (where x, y and z are integers). |
| 6. Write a set of overloaded methods min() that returns the smaller of two numbers passed to them as arguments. Make versions for int and float. |

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| Aim: To study Inheritance and types of inheritance in java |
| 1. WAP to find out the volume of a box using simple inheritance ? |
| 2. WAP to find out volume, cost and weight of a box using multilevel inheritance ? |
| 3. WAP to find out volume, cost and weight of a box using multilevel inheritance and use super keyword at appropriate place? |

Unit III. Multithreading and Exception Handling Thread:

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| Aim: To study exception handling in JAVA |
| 1. WAP to create your own Exception to check whether a number is Prime or not, Palindrome or not, even or odd. |
| 2. WAP to illustrate Arithmetic Exception,ArrayIndexOut Of BoundsException using nested Try Block with suitable example? |
| 3. WAP to detect and resolve divide by zero error using Exception with suitable example? |

Unit- IV: Multithreading

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| Aim: To study threads and multithreading in java |
| 1) WAP to perform following using Multithreading i) Sort 10 numbers in ascending order |
| ii) Find Avg. of 10 numbers |
| Searchanumberinanarray |
| 2) WAP to detect and resolve deadlock using suitable examples? |
| 3) WAP to illustrate the need of synchronization using suitable examples? |

Unit- IV: Graphics Programming

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| Aim: To study java AWT |
| Program to set the background color of the panel using the color specified in the constants of the class. |
| Aim: To study swings in java |
| Create an applet for arithmetic operations. |
| Aim: Create a application to connect JDBC application to JDBC |

Semester –IV

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| Course Code: ITY23PCP254 Course Name: Digital Image Processing - Laboratory Course Category: PCC |
| Credits: 1 Teaching Scheme: P-2 Hrs/week Evaluation Scheme: TW- 30, PR- 40 |
| Pre-requisites: signals and systems, Basic programming skills |
| Lab Objectives: This course will enable students to |
| 1. To master image processing programs utilizing point processing methods for operations like obtaining negative images, flipping images, thresholding, and contrast stretching. |
| 2. To develop proficiency in implementing image arithmetic operations, including addition, subtraction, mean value calculation, and brightness adjustment, for image manipulation and enhancement. |
| 3. To understand and apply histogram calculation and equalization techniques to analyze and improve image contrast and visual quality. |
| Lab Outcomes: At the end of the course, the students will be able to - |
| LO1 Execute image processing programs effectively, achieving tasks such as obtaining negative images, flipping images, thresholding, and contrast stretching with precision. |
| LO2 Demonstrate expertise in performing image arithmetic operations, including addition, subtraction, mean value calculation, and brightness adjustment, resulting in enhanced and manipulated images as per specific requirements. |
| LO3.Acquire the skills necessary to calculate histograms and perform histogram equalization, leading to improved contrast and visual quality in images, thereby enhancing their understanding and application of image enhancement techniques. |

List of Experiments

| Sr.No | Name of Experiment |
|-------|--|
| 1 | To write and execute image processing programs using point processing method a. Obtain Negative image b. Obtain Flip image c. Thresholding d. Contrast stretching |
| 2 | To write and execute programs for image arithmetic operations a. Addition of two images b. Subtract one image from other image c. Calculate mean value of image d. Different Brightness by changing mean value |
| 3 | Write a program for histogram calculation and equalization. |
| 4 | Perform noise removal using different spatial filters and compare their performances. |
| 5 | To write and execute program for geometric transformation of image a. Translation b. Scaling c. Rotation d. Shrinking e. Zooming |
| 6 | Apply Smoothing, Sharpening Spatial domain kernels on Images for Enhancement. |
| 7 | Apply low pass and high pass frequency domain filters on Images for Enhancement. |

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| 8 | Demonstration of Thresholding and Region Based Image Segmentation Methods. |
| 9 | Write and execute a program for image morphological operations erosion and dilation. |
| 10 | Case study : Group of 2-3 Students should study recent international journal research papers and present case study |

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Semester –IV

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| Course Code: ITY23VSP251 Course Name: Advanced Python Course Category: VSEC |
| Credits: 2 Teaching Scheme: P- 4 Hrs/week Evaluation Scheme: TW-30, PR- 20 |
| Pre-requisites: Fundamentals of python programming logic |
| Lab Objectives: This course will enable students to |
| 1. To give idea about the functions in Python |
| 2. To get acquainted with OOP concepts, modules and packages in Python |
| 3. To familiarize with MySQL and Python connectivity. |
| 4. Creating application using TKinter and Flask |
| Lab Outcomes: At the end of the course, the students will be able to - |
| LO1. Student can use the functions in Python |
| LO2. Student can implement with OOP concepts, modules and packages in Python |
| LO3. Student can connect MySQL with Python |
| LO4. Student can create application using TKinter and Flask |

Contents–Suggestive Practical List

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| <p>1.Functions :</p> <p>Built-In Functions: len(), print(), type(), int(), str(), max(), min(), sum(), range(), input(), lambda function, MAP, ZIP, REDUCE, FILTER, ANY, CHR, ORD, SORTED</p> <ul style="list-style-type: none"> ○ User Defined Functions: <ul style="list-style-type: none"> ○ Define a function add_numbers(a, b) to add two numbers. ○ Define a function square(num) to calculate the square of a number. <ul style="list-style-type: none"> ○ Provide practical examples of each built-in function. |
| <p>2. Introduction to OOP:</p> <ol style="list-style-type: none"> 2. Create a class Car with attributes and methods. 3. Implement inheritance and demonstrate polymorphism. 4. Show examples of encapsulation and abstraction. 5. Implement __str__ and __add__ methods in a class. 6. Define class methods and static methods. |
| <p>3. Exception Handling:</p> <ul style="list-style-type: none"> ○ Introduce exceptions and their types. |

- Write code using try-except, multiple except blocks, else, and finally

4. File Handling:

- Read and write binary files.
- Use the csv module for file operations.
- Serialize and deserialize data using JSON.
- Implement exception handling in file operations.

5. Database Connectivity:

- Connect to MySQL, create a database, and perform CRUD operations.

6. GUI:

- Build a basic Tkinter GUI application.
- Tkinter Widgets, Frame, Button, Label, Entry
- Create a application using Tkinter and Database (MySQL)
- Create an Application using Flask and Database (MySQL)

Text Books:

1. "Python Crash Course" by Eric Matthes, (Latest edition: 2021)
2. "Fluent Python" by Luciano Ramalho (Latest edition: 2021)
3. "Head First Python" by Paul Barry (Latest edition: 2016)

Reference Books:

1. "Fluent Python" by Luciano Ramalho (Latest edition: 2021)
2. "Python Cookbook" by David Beazley and Brian K. Jones (Latest edition: 2018)

Semester –IV

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| Course Code: ITY23HSL252 Course Name: Entrepreneurship Development Course Category: EEMC |
| Credits: 2 Teaching Scheme: L- 2 Hrs/week Evaluation Scheme: CA-60, ESE-40 |
| Duration of Theory Exam: 2 Hrs |
| Pre-requisites: Knowledge of Planning |
| Course Objectives: This course will enable students to |
| 1. To provide an overview of entrepreneurship development, covering its evolution, concepts, role in economic development, and factors affecting it. |
| 2. Types of Entrepreneurship: Introduce various types of entrepreneurship such as techno entrepreneurship, women entrepreneurship, social entrepreneurship, and intrapreneurship, along with the decision-making process and entrepreneurial environments. |
| 3. To equip students with essential skills for successful entrepreneurship, including project planning, business laws, communication, creativity, problem-solving, innovation, negotiation, and risk management, while also exploring different business organizations and legal aspects in India. |
| Course Outcomes: At the end of the course, the students will be able to - |
| CO1. Develop skills related to various functional areas of management (Marketing Management, Financial Management, Operations Management, Personnel Management etc.) |
| CO2. To develop skills related to Project Planning and Business Plan development. |
| CO3. To determine and compare various skills of successful entrepreneurs, business organizations and business laws. |
| CO4. To examine essentials to avoid failure in Entrepreneurship. |

Contents–

| Unit | Content | Teaching Hours |
|-------------|---|-----------------------|
| 1 | Introduction - Entrepreneurship Development, Evolution of Entrepreneurship, Meaning, Definition, and Concept of Enterprise, Concepts of Entrepreneurship, Role of Entrepreneurship in Economic Development, Factors Affecting Entrepreneurship, Entrepreneurial Development models and Theories, Entrepreneurial Trait Tests; Business Opportunity Identification. | 8 |

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| 2 | Entrepreneur- Major types of Entrepreneurship – Techno Entrepreneurship, Women Entrepreneurship, Social Entrepreneurship, Intrapreneurship (Corporate entrepreneurship), Rural Entrepreneurship, Family Business etc. The entrepreneurial decision process, Entrepreneurial Environment – Political, Legal, Technological, Natural, Economic, Socio – Cultural etc. | 7 |
| 3 | Project Planning - Project Planning, Skills for Successful Entrepreneurs & Business Organizations and Business Laws: Project report; Project appraisal; Setting up an Industrial unit – procedure and formalities in setting up an Industrial unit; Business Plan Development, Communication Skills, Creativity and Problem-solving, Innovation, Negotiation Skills, Risk management. Types of Business Organizations –Sole, Proprietorship, Joint Hindu Family Business, Partnership, Limited Liability Partnership (LLP), Corporate Governance, Franchising, Business Laws in India to Start Business. | 8 |
| 4 | Concepts of Entrepreneurship Failure - Issues of Entrepreneurial failure, Reasons of Entrepreneurial Failure, Essentials to Avoid Failure in Entrepreneurship. Case Study of Failure in Entrepreneurship. | 7 |

Text Books:

1. Dynamics of Entrepreneurship Development – Vasant Desai.
2. Entrepreneurship Development and small business management – Poornima M. Charantimath
3. Dynamics of Entrepreneurship Development – Vasant Desai.
1. Innovation and Entrepreneurship – Peter F. Drucker
2. Kathleen R Allen, Launching New Ventures, An Entrepreneurial Approach, Cengage Learning, 2016.
3. Vijay Sathe, Corporate Entrepreneurship, Cambridge, 2009.

Semester –IV

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| Course Code: MGM21VEL101 Course Name: Environmental Studies Course Category: Basic Science |
| Credits: 2 Teaching Scheme: L- 2 Hrs/week Evaluation Scheme: CA-60, ESE-40 |
| Duration of Theory Exam: 2 Hrs |
| Pre-requisites: Basic Science |
| Course Objectives: This course will enable students to |
| 1. To study the environment and ecosystems. |
| 2. To study different types of natural resources |
| 3. To study concept of biodiversity and its conservation |
| 4. To study the concept of causes, effects and control of different types of environmental pollution |
| 5. To study population growth and its impact on environment |
| Course Outcomes: At the end of the course, the students will be able to - |
| CO1. Describe environment and ecosystem |
| CO2. Explain environmental impacts of human activities on natural resource |
| CO3. Identify the importance of conservation of biodiversity. |
| CO4. Describe the problems of environmental pollution, its impact on human and ecosystem and control measures |
| CO5. Identify the impact of increased population on environment |

Contents–

| Unit | Content | Teaching Hours |
|------|---|----------------|
| 1 | Ecosystem and the Environment - a. Definition, Scope and importance of Environmental studies, Need for Public awareness. b. Concepts of an Ecosystem, Structure and functions of an Ecosystem. a. Producers, Consumers and Decomposers in an Ecosystem | 6 |
| 2 | Natural Resources - a. Renewable and non-renewable resources, Role of individuals in conservation of natural resources for sustainable lifestyles. | 6 |

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| | a. Use and over exploitation of Forest resources, Deforestation, Timber extraction, Mining, Dams and their effects on forest and tribal people b. Use and over exploitation of surface and ground water resources, Floods, Drought, Conflicts over water, Dams- benefits and problems. | |
| 3 | Biodiversity and its Conservation - a. Definition, Genetic, Species and Ecosystem diversity, Bio-geographical classification of India. b. Value of biodiversity: Consumptive use, Productive use, Social, Ethical, Aesthetic and option values. | 6 |
| 4 | Environmental pollution- a. Definition, Causes, effects and control measures of Air pollution. Water pollution and Soil pollution. b. Causes, effects and control measures of Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards | 6 |
| 5 | Population issues and the Environment - a. Population growth, Variation among nations, Population explosion- Family welfare programmes, Environment and Human health, Human rights, Value education, HIV/AIDS. b. Woman and Child welfare, Role of information technology in environment and human health, Case studies | 6 |

Text Books:

- 1 Bharucha Erach (ed) Text Book of Environmental Studies., University Press (India) Pvt. Ltd
2. Bharucha Erach, 2003. The Biodiversity of India, Mapin Publishing Pvt. Ltd, Ahmedabad – 380013
3. Kaushik, Anubha & Kaushik, C.P. 2006. Perspectives in Environmental Studies, New Age International (P) Ltd. Publisher, New Delhi
4. Deswal, S. and Deswal, A. 2005. A Basic Course in Environmental Studies. Dhanpat Rai & Co Ltd., Delhi.

Reference Books:

1. IndiaSantra S.C, (ed), Environmental Science, New Central Agency Pvt Ltd. Kolkata, India.
2. Botbin, D., and Keller, E.1995. Environmental Science. John Wiley and Sons, USA.
3. Cunningham, W.P. and Saigo, B.W. 1997. Environment Science. McGraw-Hill, USA.
4. Lal, R. and Stewart, B.A. 1992. Advances in Science: Soil Restoration Springer Verlag, New York.

Semester-V

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|--|---|---|
| Course code: ITY23PCL301 | Course name: Design and Analysis of Algorithms | Course category: PCC |
| Credits: 3 | Teaching scheme: L-3 Hrs/Week | Evaluation scheme: CA-40, MSE-20, ESE-40 |
| Duration of Theory Exam: 2 Hrs | | |
| Pre-requisites: 1. Knowledge of C programming, Data Structures | | |
| Course Objectives: | | |
| 1. To learn fundamentals of algorithm design techniques. | | |
| 2. To understand basic knowledge of computational complexity, approximation and randomized algorithms, selection of the best algorithm to solve a problem. | | |
| 3. To design and analyse the performance of algorithms and to compare algorithms with respect to time and space complexity. | | |
| 4. To develop proficiency in problem solving and programming. | | |
| Course Outcomes: At the end of the course, the students will be able to - | | |
| CO1: Gain understanding of concepts of time and space complexity in terms of worst, average and best case using Asymptotic Notations. | | |
| CO2: Design standard algorithms such as sorting, searching, problems involving graphs etc. using various design techniques and compute complexity measures of these algorithms. | | |
| CO3: Design algorithms for optimization problems. | | |

Contents –

| Unit | Content | Teaching hours |
|------|--|----------------|
| 1 | Introduction- Fundamental concepts of algorithm: characteristics, Specifications; Frequency count and its importance in analysis of an algorithm; Asymptotic Notations, Time complexity & Space complexity of an algorithm; Sorting methods: bubble, insertion, heap sort. Analysis of each sorting technique for best, worst and average cases | 8 |
| 2 | Divide and Conquer - The general method, Binary Search, finding the maximum and minimum, Merge Sort, Quick Sort, selection and Strassen's matrix multiplication. | 8 |
| 3 | Greedy Method - The general method, optimal storage on tapes, Knapsack problem, Job sequencing with deadlines, Optimal merge patterns, Minimum spanning trees, Single source shortest paths. | 8 |
| 4 | Dynamic Programming and Traversal Techniques - The general method, Multistage graphs, All pairs shortest paths, 0/1 Knapsack, The Travelling salesman problem. Tree traversal techniques, Graph traversal techniques: DFS, BFS, connected components, Bi-connected components & spanning trees | 8 |
| 5 | Backtracking - The general Method, The 8-Queens Problems, Sum of subsets, Graph coloring. Hamiltonian cycles. | 8 |

Text Books: 1. E. Horowitz, S. Sahni and S. Rajasekaran, "Computer Algorithms", Silicon Press, 2nd Edition, 2008.

2. Thomas Cormen, Charles Leiserson, Ronald Rivest and Clifford Stein, “Introduction to Algorithms”, MIT Press, 3rd Edition, 2009

Reference Books: 1. B. K. Joshi, “Data Structures and Algorithms in C++”, Tata McGraw Hill Education, 2010.

2. G. T. Heineman, Gary Pollice, Stanley Selkow, “Algorithms in a Nutshell”, Shroff Publication, 1st Edition, 2008.

Online Resources: 1. NPTEL / SWAYAM lectures.

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Semester-V

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|---|---|---|
| Course code: AIM23PCL301 | Course name: Machine Learning & Applications | Course category: PCC |
| Credits: 2 | Teaching scheme: L-2 Hrs/Week | Evaluation scheme: CA-40, MSE-20, ESE-40 |
| Duration of Theory Exam: 2 Hrs | | |
| Pre-requisites: 1.Statistics, Linear Algebra, Calculus, Probability 2.Programming Languages | | |
| Course Objectives: | | |
| 1. To understand the basics of Machine Learning. | | |
| 2. To learn and will be able to apply different machine learning models to various datasets. | | |
| Course Outcomes: At the end of the course, the students will be able to - | | |
| CO1: Understand basic applications and issues of Machine Learning | | |
| CO2: Explore different types of datasets | | |
| CO3: Analyze and work with different datasets | | |
| CO4: Analyze various Machine Learning techniques and algorithms | | |
| CO5: Apply various algorithms to different datasets. | | |

Contents –

| Unit | Content | Teaching hours |
|------|---|----------------|
| 1 | Introduction to Machine Learning - What is Machine Learning?, How Do We Define Learning?, How Do We Evaluate Our Networks?, How Do We Learn Our Network?, What are datasets and how to handle them?, Feature sets, Dataset division: test, train and validation sets, cross validation.. | 6 |
| 2 | Basics of machine learning - Applications of Machine Learning, processes involved in Machine Learning, Introduction to Machine Learning Techniques: Supervised Learning, Unsupervised Learning and Reinforcement Learning, Real life examples of Machine Learning | 6 |
| 3 | Supervised learning- Classification and Regression: K-Nearest Neighbor, Linear Regression, Logistic Regression, Support Vector Machine (SVM), Evaluation Measures: SSE, MME, R2, confusion matrix, precision, recall, F-Score, ROC-Curve. | 6 |
| 4 | Unsupervised learning - Introduction to clustering, Types of Clustering: Hierarchical, Agglomerative Clustering and Divisive clustering; Partitional Clustering | 6 |
| 5 | Applications of ML - Dimensionality reduction techniques: PCA, LDA, ICA. Introduction to Deep Learning, Gaussian Mixture Models, Natural Language Processing, Computer Vision | 6 |

Text Books: 1. Introduction to Machine Learning, By Jeeva Jose, Khanna Book Publishing Co., 2020.
2. Machine Learning for Dummies, By John Paul Mueller and Luca Massaron, For Dummies, 2016.
3. Machine Learning, By Rajeev Chopra, Khanna Book Publishing Co., 2021.

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| Reference Books: 1. Machine Learning: The New AI, By Ethem Alpaydin, The MIT Press, 2016. |
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| 2. Machine Learning, Tom M. Mitchell, McGraw Hill Education, 2017. |
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| Online Resources: 1. NPTEL / SWAYAM lectures. |
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| 1. https://www.udacity.com/course/intro-to-machine-learning--ud120 |
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| 2. https://www.coursera.org/learn/machine-learning-duke |
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Semester-V

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| Course code: ITY23PCL303 | Course name: Database Management Systems | Course category: PCC |
| Credits: 2 | Teaching scheme: L-2 Hrs/Week | Evaluation scheme: CA-40, MSE-20, ESE-40 |
| Duration of Theory Exam: 2 Hrs | | |
| Pre-requisites: No prerequisite is required, however having knowledge on Set Theory will help. | | |
| Course Objectives: | | |
| 1.To understand architecture and functioning of database management systems. | | |
| 2. To learn relational mode. | | |
| 3. To use structured query language (SQL) and its syntax, transactions, database recovery and techniques for query optimization. | | |
| 4. To acquaint with various normalization forms and query processing. | | |
| 5. To learn indexing methods | | |
| Course Outcomes: At the end of the course, the students will be able to - | | |
| CO1: Understand, appreciate and effectively explain the underlying concepts of database technologies | | |
| CO2: Design and normalize database schema for a given problem-domain | | |
| CO3: Populate, query and enforce integrity constraints on databases using commands. | | |
| CO4: Understand basics of transaction management. | | |

Contents –

| Unit | Content | Teaching hours |
|------|--|----------------|
| 1 | Introduction to DBMS and ER Model - Introduction, An Example of Database, Characteristics of Database Approach, Actors on the Scene Workers behind the Scene, Data models ER Model Entity Types, Entity sets, Attributes, Keys, Relationship Types, S Relationship Sets, Roles, Structural Constraints, Strong and Weak entity types, E-R diagram: Naming Conventions, The Enhanced ER Model: Subclasses, Super classes and Inheritance , Specialization and Generalization, Union Types using Categories, Data Abstraction. | 8 |
| 2 | Structured Query Language - SQL Data Definition and Data Types, Specifying Constraints in SQL, INSERT, DELETE, and UPDATE Statements in SQL, DDL, Tables: creating, modifying, deleting Views: creating, dropping, Updation using views, DML, Operators, SQL DML queries, SELECT, Set operations, Predicates and joins, Set membership, Tuple variables, Set comparison, Ordering of tuples, Aggregate functions, Nested queries, Integrity Constraints, Triggers | 8 |
| 3 | Normalization - Normalization, Functional Dependencies, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form, Properties for Relational Decompositions: Relation, Dependency Preservation, Property of a Decomposition, Multi-valued Dependencies and 4NF. | 8 |

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| 4 | Transaction Management and Concurrency control- Introduction to Transaction Processing ACID Properties of Transactions, Characterizing Schedules Based on Recoverability, Characterizing Schedules Based on Serializability, Concurrency Control, Concurrency Control Based on Lock Based Protocol, Deadlock Handling, Multiple Granularity, Timestamp Based Protocol, Validation Based Protocol. | 8 |
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| Text Books: 1. Abraham Silberschatz, Henry F. Korth, and S. Sudarshan, “Database System Concepts”, McGraw Hill Education, 6th Edition, 2011. | | |
| 2. Ramez Elmasri and Shamkant B. Navathe, “Fundamental Database Systems”, Pearson Education, 7th Edition, 2015. | | |
| Reference Books: 1. Carlos Coronel, Steven Morris “Database systems: Design Implementation and Management”, Cengage Learning Press, 11th Edition, 2014. | | |
| 2. J. Murach, “Murach’s MySQL”, Shroff Publication, 2nd Edition, 2016. | | |
| Online Resources: 1. NPTEL / SWAYAM lectures. | | |

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Semester-V

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|--|--|---|
| Course code: AIM23PCL302 | Course name: Artificial Intelligence Applications | Course category: PCC |
| Credits: 2 | Teaching scheme: L-2 Hrs/Week | Evaluation scheme: CA-40, MSE-20, ESE-40 |
| Duration of Theory Exam: 2 Hrs | | |
| Pre-requisites: 1.Strong Knowledge of Mathematics: probability, statistics, algebra, matrix, calculus, etc. | | |
| 2.Good knowledge of Programming knowledge: Python, R, Java, C++, etc. | | |
| 3.Strong Analytical skills | | |
| 4.Ability to understand complex algorithms. | | |
| Course Objectives: | | |
| 1. To learn the basic concepts and techniques of Artificial Intelligence. | | |
| 2. To develop AI algorithms for solving practical problems. | | |
| Course Outcomes: At the end of the course, the students will be able to - | | |
| CO1: Understand the basic concepts and techniques of Artificial Intelligence. | | |
| CO2: Apply AI algorithms for solving practical problems. | | |
| CO3: Describe human intelligence and AI. | | |
| CO4: Explain how the intelligent system works. | | |
| CO5: Apply basics of Fuzzy logic and neural networks. | | |

Contents –

| Unit | Content | Teaching hours |
|------|--|----------------|
| 1 | Introduction- Artificial Intelligence and its applications, Artificial Intelligence Techniques, Level of models, criteria of success, Intelligent Agents, Nature of Agents, Learning Agents. AI Techniques, advantages, and limitations of AI, Impact and Examples of AI, Application domains of AI. The AI Ladder - The Journey for Adopting AI Successfully, Advice for a career in AI, Hotbeds of AI Innovation | 6 |
| 2 | Problem solving techniques- State space search, control strategies, heuristic search, problem characteristics, production system characteristics., Generate and test, Hill climbing, best first search, A* search, Constraint satisfaction problem, Mean-end analysis, Min-Max Search, Alpha-Beta Pruning, Additional refinements, Iterative Deepening. | 6 |
| 3 | Logic- Propositional logic, predicate logic, Resolution, Resolution in propositional logic and predicate logic, Clause form, unification algorithm | 6 |
| 4 | Knowledge Representation schemes and reasoning- Mapping between facts and representations, Approaches to knowledge representation, procedural vs declarative knowledge, Forward vs. Backward reasoning, Matching, conflict resolution, Nonmonotonic reasoning, Default reasoning, statistical reasoning, fuzzy logic Weak and Strong filler structures, semantic nets, frame, conceptual dependency, scripts | 6 |
| 5 | Planning- | 6 |

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| | The Planning problem, planning with state space search, partial order planning, planning graphs, planning with propositional logic, Analysis of planning approaches, Hierarchical planning, conditional planning, Continuous and Multi Agent planning. | |
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| Text Books: |
| 1. A Classical Approach to Artificial Intelligence, M.C. Trivedi, Khanna Book Publishing, 2019. |
| 2. Artificial Intelligence: A modern approach by Stuart Russel, Pearson Education, 2010. |
| 3. Artificial Intelligence by Rich and Knight, The McGraw Hill, 2017. |
| Reference Books: 1. |
| 1. Artificial Intelligence: A new synthesis by Nils and Nilson, Elsevier, 1997. |
| 2. Artificial Intelligence by Luger, Pearson Education, 2002. |
| 3. Artificial Intelligence by Padhy, Oxford Press, 2005. |
| Online Resources: |
| 1. https://www.edx.org/course/artificial-intelligence-ai |
| 2. https://www.udemy.com/course/artificial-intelligence-az/ |

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Semester-V

| | | |
|---|--------------------------------------|--|
| Course code: ITY23PCP301 Course name: Design and Analysis of Algorithms - Lab Course category: PCC | | |
| Credits: 1 | Teaching scheme: P-2 Hrs/Week | Evaluation scheme: TW-30, PR-20 |
| Pre-requisites: Knowledge of any programming language | | |
| Lab Objectives: | | |
| 1.To familiarize students with different algorithm design paradigms, including divide and conquer, greedy, dynamic programming, backtracking, and branch-and-bound. | | |
| 2.To enhance problem-solving skills by solving real-world problems through appropriate algorithmic approaches. | | |
| Lab Outcomes: At the end of the course, the students will be able to - | | |
| LO1: Design algorithms using various strategies to solve computational problems effectively. | | |
| LO2: Demonstrate the ability to implement algorithms efficiently in a programming language of their choice. | | |
| LO3: Apply algorithms to solve real-world problems in domains such as sorting, searching, graph traversal, and optimization. | | |
| LO4: Develop critical thinking skills to select the most appropriate algorithm for a given problem based on its constraints and requirements. | | |

List of Experiments

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| 1. Program to implement Heap sort. |
| 2. Program to implement Insertion, bubble and selection sort. |
| 3. Program to implement binary search algorithm using DnC method. |
| 4. Program to implement maxmin algorithm using DnC method. |
| 5. Program to implement merge sort algorithm using DnC method. |
| 6. Program to implement a quick sort algorithm using DnC method. |
| 7. Program to implement knapsack problem using greedy method. |
| 8. Program to implement Job Sequencing with Deadlines using greedy method. |
| 9. Program to implement Prim's/Kruskal's Algorithm using Greedy method. |
| 10. Program to implement graph traversal technique: BFS. |
| 11. Program to implement graph traversal technique: DFS. |

Semester-V

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|---|--------------------------------------|--|
| Course code: AIM23PCP301 Course name: Machine Learning and Applications Lab | | |
| Course category: PCC | | |
| Credits: 1 | Teaching scheme: P-2 Hrs/Week | Evaluation scheme: TW-30, PR-20 |
| Pre-requisites: Statistics, Knowledge of any one programming language | | |
| Lab Objectives: | | |
| 1. To learn to use the Pandas library for importing, cleaning, and exporting datasets. | | |
| 2. To apply various data pre-processing techniques and visualization methods to analyze datasets. | | |
| 3. To develop various machine learning models, including regression, classification, and clustering techniques, and evaluate their performance. | | |
| Lab Outcomes: At the end of the course, the students will be able to - | | |
| LO1: Perform basic data manipulation tasks | | |
| LO2: Apply data cleaning techniques, such as handling missing values, normalizing, encoding categorical variables, and dealing with outliers | | |
| LO3: Create a variety of plots (scatter, line, bar, histogram, etc.) to explore the structure of datasets and present findings clearly | | |
| LO4: To build various machine learning models evaluate using accuracy, precision, recall, and ROC-AUC metrics. | | |

List of Experiments:

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| 1. Write a python program to import and export data using Pandas library functions |
| 2. Demonstrate various data pre-processing techniques for a given dataset. |
| 3. Implement Dimensionality reduction using Principal Component Analysis (PCA) method. |
| 4. Write a Python program to demonstrate various Data Visualization Techniques. |
| 5. Implement Simple and Multiple Linear Regression Models. |
| 6. Develop Logistic Regression Model for a given dataset. |
| 7. Develop Decision Tree Classification model for a given dataset and use it to classify a new sample. |
| 8. Implement Naïve Bayes Classification in Python. |
| 9. Build KNN Classification model for a given dataset. |
| 10. Write a python program to implement K-Means clustering Algorithm. |

Semester-V

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| Course code: ITY23PCP303 | | | Course name: Database Management System - Lab | | | Course category: PCC | | |
| Credits: 1 | | | Teaching scheme: P-2 Hrs/Week | | | Evaluation scheme: TW–30, PR–20 | | |
| Pre-requisites: | | | | | | | | |
| 1. Basic Programming Knowledge | | | | | | | | |
| 2. Understanding of Data Structures | | | | | | | | |
| Lab Objectives: | | | | | | | | |
| 1.To introduce students to the foundational concepts of databases, including data modeling, database architecture, and relational algebra. | | | | | | | | |
| 2.To enable students to write, execute, and debug SQL queries for data definition, data manipulation, and data control. | | | | | | | | |
| 3. To provide hands-on experience in using popular DBMS tools and platforms, such as MySQL, PostgreSQL, or Oracle. | | | | | | | | |
| Lab Outcomes: At the end of the course, the students will be able to - | | | | | | | | |
| LO1: Demonstrate the ability to design and develop relational database schemas using Entity-Relationship (ER) modeling techniques. | | | | | | | | |
| LO2: Write and execute SQL queries for data definition, data manipulation, and data control, including complex queries using joins, subqueries, and aggregations. | | | | | | | | |
| LO3: Perform basic database administration tasks such as backup, restore, and user privilege management. | | | | | | | | |
| LO4: Gain proficiency in using database management tools like MySQL Workbench, PostgreSQL, SQL Server Management Studio, or Oracle SQL Developer. | | | | | | | | |

List of Experiments

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| 1. Study of E-R Diagram |
| 2. Study of Data Definition Language command |
| 3. Study of Data Manipulation Language |
| 4. Study of data communication using SQL functions. |
| 5. Writing subqueries in join operation |
| 6. Creation of triggers. |
| 7. Creating Views |
| 8. Writing and Executing PL/SQL block |
| 9. Study of GRANT and REVOKE DBA commands |
| 10. Normalization in oracle |

Semester-V

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|---|
| Course code: ITY23PEL302 Course name: Microprocessor, Microcontroller and IOT devices Course category: PEC |
| Credits: 3 Teaching scheme: L-3 Hrs/Week Evaluation scheme: CA-40, MSE-20, ESE-40 |
| Duration of Theory Exam: 2 Hrs |
| Pre-requisites: Digital logic Design |
| Course Objectives: |
| 1. To Understand Microprocessor Basics |
| 2. To Understand Assembly Language Programming |
| 3. To study of Microcontroller Architecture and Organization |
| 4 To study of IoT Fundamentals |
| Course Outcomes: At the end of the course, the students will be able to - |
| CO1: Understand Microprocessor Architecture |
| CO2: Apply instruction set knowledge for writing programs |
| CO3: Interface various peripherals with microprocessor and microcontroller |
| CO4: Understand the basic concepts and principles of the Internet of Things. |

Contents –

| Unit | Content | Teaching hours |
|------|---|----------------|
| 1 | Architecture of 8085 - Microprocessor and Programming: Functional Block Diagram, Registers, ALU, Bus systems, Timing and control signals, Machine cycles and timing diagrams. Instruction formats, Addressing modes, Instruction set, Need for Assembly language, Development of Assembly language programs | 9 |
| 2 | Interfacing: Memory Interfacing - Interface requirements; Address space partitioning, Buffering of Buses, timing constraints, Memory control signals, Read and write cycles, interfacing SRAM, EPROM and DRAM sections. I/O Interfacing: Memory mapped I/O Scheme, I/O mapped I/O scheme, Input and Output cycles, Simple I/O ports, Programmable peripheral interface (8255). Data transfer schemes: Programmable data transfer, DMA data transfer, Synchronous, Asynchronous and interrupt driven data transfer schemes, Interfacing, Simple keyboards and LED displays. | 9 |
| 3 | Interrupts and DMA- Interrupt feature, Need for interrupts, Characteristics of Interrupts, Types of Interrupts, Interrupt structure, Methods of servicing interrupts, Development of Interrupt service subroutines, Multiple interrupt request and their handling, need for direct memory access, Devices for Handling DMA, Programmable DMA controller 8237, Applications of microprocessors. | 9 |
| 4 | Intel 8051 Microcontroller - Architecture of 8051, Memory Organization, Addressing modes, Instruction set, Boolean processing, Simple programs. | 9 |
| 5 | IOT device- Fundamentals of IoT: Introduction, Definitions & Characteristics of IoT, IoT Architectures, Physical & Logical Design of IoT, Enabling Technologies in IoT, History of IoT, About Things in IoT, The Identifiers in IoT, About the Internet in IoT, IoT frameworks, IoT and M2M | 9 |

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| Text Books: 1. Gaonkar, R.S., “Microprocessor Architecture Programming and Applications with the 8085/8080A, 3rd Edition, Penram International Publishing House, 1997. |
| Reference Books: |
| 1. Singh. I.P., “Microprocessor Systems”, Module 9: Microcontrollers and DR. BABASAHEB MBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE INSTRUMENTATION ENGINEERING their Applications”, IMPACT Learning Material Series IIT, New Delhi, 1997. |
| 2. Douglas, V. Hall. “Microprocessor and Interfacing Programming and Hardware”, 2ndEdition, McGraw Hill Inc., 1992. |
| 3. Kenneth, L. Short., “Microprocessors and Programmed Logic”, Prentice Hall of India, 2nd Edition, 1987. Hakima Chaouchi, — “The Internet of Things Connecting Objects to the Web” ISBN : 978-1- 84821-140-7, Wiley Publications |
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Semester-V

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|--|--------------------------------------|---|
| Course code: AIM23PEL301 | Course name: Expert Systems | Course category: PEC |
| Credits: 3 | Teaching scheme: L-3 Hrs/Week | Evaluation scheme: CA-40, MSE-20, ESE-40 |
| Duration of Theory Exam: 2 Hrs | | |
| Pre-requisites: 1. Programming Skills Required of any Programming Language. | | |
| 2. Should have knowledge of Problem solving Paradigms and AIML. | | |
| 3. General experience of computing in programming is required. Some familiarity with logic is also very desirable. | | |
| Course Objectives: | | |
| 1. To study the idea of intelligent agents and search methods. | | |
| 2. To study about representing knowledge. | | |
| 3. To study reasoning and decision making in an uncertain world. | | |
| 4. To construct plans and methods for generating knowledge. | | |
| 5. To study the concepts of expert systems. | | |
| Course Outcomes: At the end of the course, the students will be able to - | | |
| CO1: Introduction to demonstration to Expert System to solve various problems | | |
| CO2: Identify various networks and learning algorithms in artificial neural network | | |
| CO3: Design and analysis of algorithms for a given problem. | | |
| CO4: Understand and Implement the preprocessing of the data to be used for machine learning models | | |

Contents –

| Unit | Content | Teaching hours |
|------|--|----------------|
| 1 | Introduction to Expert system - Introduction, What is an Expert System, Advantages of Expert System, General Concepts of Expert System, Characteristics of Expert System, The Development of Expert System Technology, Expert System Application and Domains. | 9 |
| 2 | Expert system and artificial Intelligence - Elements of Expert Systems, Production System, Procedural Paradigms, Non-Procedural Paradigms, Artificial Neural Networks, Connectionist Expert System and Inductive Learning, The State of Art in artificial Intelligence, General Terms in Expert Systems, Development in Artificial Intelligence ,Development in Expert Systems ,Role of AI in Expert Systems. | 9 |
| 3 | Knowledge Based Expert System - Introduction, The Meaning of knowledge, Production, Semantic Nets, Object-Attribute-Value- Triples, Introduction-What is knowledge-based expert system(KEBS). | 9 |
| 4 | Architecture of KEBS - Knowledge Base , Inference Mechanism, Inexact Reasoning, Non-Monotonic Reasoning, Reasoning Based on Certainty Factors. | 9 |
| 5 | Process Models and Knowledge based Systems- Introduction , Expert System for Diagnosis, Understanding of Domain Knowledge, Evolution of Knowledge nets, Transformation of Knowledge From Nets to Rule Base, Blackboard Architecture, Blackboard Framework, Integrated Engineering Systems, Illustrative Examples. | 9 |

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| Text Books: 1. Michael Negnevitsky: Artificial Intelligence. A Guide to Intelligent Systems, Addison Wesley, Second Edition, 2005. |
| 2. N.J. Nilsson, "Principles of AI", Narosa Publications House, 1990. |
| Reference Books: 1. C.S. Krishnamoorthy, S. Rajeev - Artificial Intelligence and Expert Systems for Engineers -CRC-Press (1996) |
| 2. Expert Systems - Principles and Programming-Course Technology (2005) |
| Online Resources: 1. NPTEL / SWAYAM lectures. |
| 1. https://www.javatpoint.com/expert-systems-in-artificial-intelligence |

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Semester-V

| | | |
|---|--|---|
| Course code: AIM23PEL302 | Course name: Mathematical Foundation for Cyber Security | Course category: PEC |
| Credits: 3 | Teaching scheme: L-3 Hrs/Week | Evaluation scheme: CA-40, MSE-20, ESE-40 |
| Duration of Theory Exam: 2 Hrs | | |
| Pre-requisites: Basic mathematics, Data compression techniques | | |
| Course Objectives: | | |
| 1. To provide a fundamental concept of abstract algebra. | | |
| 2. To study basic concepts of set theory and binary operation. | | |
| 3. To study different operations on algebraic structure. | | |
| 4. To study advanced number theory concept | | |
| Course Outcomes: At the end of the course, the students will be able to - | | |
| CO1: Define the concepts related to the basics of set theory and binary operations. | | |
| CO2: Demonstrate knowledge and understanding of groups, subgroups, and order of an element in finite groups. | | |
| CO3: Develop understanding of algebraic structure, ring, and field. | | |
| CO4: Discover different operations on algebraic structure. | | |
| CO5: Choose appropriate algebraic structure for cryptographic operation. | | |
| CO6: Develop understanding of the use of algebraic structure in number theory algorithms. | | |

Contents –

| Unit | Content | Teaching hours |
|------|---|----------------|
| 1 | Fundamentals of Integer and Modular Arithmetic- Integer arithmetic, modular arithmetic, matrices, Linear Congruence: Definition – Basic properties of congruence, Divisibility - Greatest common divisor, equivalence classes, residue classes. | 8 |
| 2 | Prime Numbers, Congruences, and Computational Number Theory- Primes, primality testing, factorization, Chinese remainder theorem, quadratic congruence, exponentiation and logarithm. | 8 |
| 3 | Algebraic structures: groups, fields, rings, Modulo groups - Primitive roots – Discrete logarithms. Finite fields – GF (p), GF(2n) – polynomial arithmetic | 8 |
| 4 | Foundations of Cryptographic Security- SHANNON'S THEORY: Introduction, Elementary Probability Theory, Perfect Secrecy, Entropy, Properties of Entropy, Spurious Keys & Unicity distance, Product Cryptosystems. | 8 |
| 5 | Pseudorandom Number Generation and Cryptographic Security- Pseudorandom Number Generation, Introduction and examples Indistinguishability of Probability Distributions - Next Bit Predictors - The Blum-Blum-Shub Generator – Security of the BBS Generator. | 8 |

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| Text Books: 1. D.S. Dummit and R.M. Foote, "Abstract Algebra", John Wiley |
| 2. Michael Artin, "Algebra", Pearson Education. |
| 3. J.A. Gallian, "Contemporary Abstract Algebra", Narosa Publishing House. |
| Reference Books: 1. I N. Herstein, "Topics in Algebra", Wiley. |
| 2. N. Jacobson, "Basic Algebra I", Hindustan Publishing Company. |
| 3. William Stallings, "Cryptography and Network Security Principles and Practice", Pearson Education. |
| |
| Online Resources: 1. NPTEL / SWAYAM lectures. |
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MGMUNIVERSITY

Semester-V

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|--|--------------------------------------|--|
| Course code: ITY23PEP302 Course name: Microprocessor, Microcontroller and IoT Devices- LAB | | |
| Course category: PEC | | |
| Credits: 1 | Teaching scheme: P-2 Hrs/Week | Evaluation scheme: TW–30, PR–20 |
| Pre-requisites: Knowledge of digital electronics | | |
| Lab Objectives: | | |
| 1. To provide hands-on experience with assembly language programming and interfacing techniques. | | |
| 2. To apply theoretical knowledge of microprocessors/microcontrollers in practical scenarios | | |
| 3. To understand how microcontrollers are utilized in various industrial and domestic applications | | |
| Lab Outcomes: At the end of the course, the students will be able to - | | |
| LO1: Write and execute assembly and embedded C programs for microprocessors and microcontrollers. | | |
| LO2: Integrate sensors, actuators, and communication modules with microcontrollers. | | |
| LO3: work in teams to design and implement mini-projects using microcontrollers. | | |

List of Experiments

| Sr. No. | Name of Practical |
|---------|---|
| 1 | Write a program using 8085 Microprocessor for Decimal, Hexadecimal addition and subtraction of two Numbers. |
| 2 | Write a program using 8085 Microprocessor for addition and subtraction of two BCD numbers. |
| 3 | To perform multiplication and division of two 8 bit numbers using 8085. |
| 4 | To find the largest and smallest number in an array of data using the 8085 instruction set. |
| 5 | To write a program to arrange an array of data in ascending and descending order. |
| 6 | To convert a given Hexadecimal number into its equivalent ASCII number and vice versa using the 8085 instruction set. |
| 7 | Arduino connect with DHT sensor |
| 8 | Arduino connects with Ultrasonic sensor |
| 9 | 8051 interfacing with LED, LCD, stepper motor, ADC, DAC etc. |

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Semester-V

| | | |
|---|--|--|
| Course code: AIM23PEP301 | Course name: Expert Systems Lab | Course category: PEC |
| Credits: 1 | Teaching scheme: P-2 Hrs/Week | Evaluation scheme: TW-30, PR-20 |
| Pre-requisites: Basic Programming Knowledge | | |
| Lab Objectives: | | |
| 1. To understand and apply the use of Prolog in AI for knowledge representation and reasoning. | | |
| 2. To explore and implement Fuzzy Systems in AI, including fuzzification and defuzzification techniques. | | |
| 3. To integrate Prolog with Fuzzy Systems for developing intelligent systems capable of handling uncertainty. | | |
| Lab Outcomes: At the end of the course, the students will be able to - | | |
| LO1: Implement basic AI logic using Prolog for rule-based systems. | | |
| LO2: Design and apply Fuzzy Systems to handle imprecise data and decision-making. | | |
| LO3: Integrate Prolog and Fuzzy Systems to develop AI systems that can reason with uncertainty and incomplete information. | | |

List of Experiments

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|---|
| 1. History of Artificial intelligence and Expert System |
| 2. Introduction to Prolog and Python(Reading, Writing, Training) |
| 3. Prolog in AI, Fuzzy Systems. |
| 4. Fuzzy Systems, Fuzzy clips uses a guide. |
| 5. Artificial Neural Networks(CNN,ANN) |
| 6. Neural Networks, Perform Evaluation and Cross Validation. |
| 7. Radial Basis Networks and Support vector Machines. |
| 8. Evolutionary Computation. |
| 9. Project 1: Fuzzy Expert Systems |
| 10. Project 2: Neural Networks Classification. |

Semester-V

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|--|--------------------------------------|--|
| Course code: AIM23PEP302 Course name: Mathematical Foundation for Cyber Security Lab | | |
| Course category: PEC | | |
| Credits: 1 | Teaching scheme: P-2 Hrs/Week | Evaluation scheme: TW-30, PR-20 |
| Pre-requisites: Basic Knowledge of Number Theory and Cryptography | | |
| Lab Objectives: | | |
| 1. Implement modular arithmetic operations for cryptography. | | |
| 2. Study and apply finite field and matrix operations in cryptographic algorithms. | | |
| 3. Solve cryptographic problems using number theory techniques like GCD and discrete logarithms. | | |
| Lab Outcomes: At the end of the course, the students will be able to - | | |
| LO1: Apply modular arithmetic and finite field operations in cryptography. | | |
| LO2: Implement and analyze matrix-based encryption algorithms. | | |
| LO3: Use number theory to solve cryptographic problems and assess security. | | |

List of Experiments

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| <p>1. Modular Arithmetic:</p> <ol style="list-style-type: none"> Implement modular arithmetic operations such as addition, subtraction, multiplication, and exponentiation. Use modular arithmetic to compute remainders, calculate modular inverses, and perform modular exponentiation. Apply modular arithmetic in cryptographic algorithms like RSA for key generation and encryption. |
| <p>2. Finite Fields:</p> <ol style="list-style-type: none"> Study finite fields (also known as Galois fields) and their properties relevant to cryptography. Implement arithmetic operations in finite fields, including addition, subtraction, multiplication, and exponentiation. Use finite fields in cryptographic algorithms like AES (Advanced Encryption Standard) for encryption and decryption. |
| <p>3. Matrix Operations:</p> <ol style="list-style-type: none"> Implement matrix operations such as addition, subtraction, multiplication, and inversion. Explore the role of matrices in cryptographic algorithms like Hill cipher for encryption and decryption. Analyze the security and efficiency of matrix-based encryption schemes. |
| <p>4. Discrete Logarithm Problem:</p> <ol style="list-style-type: none"> Study the discrete logarithm problem and its significance in cryptography. Implement algorithms like baby-step-giant-step or Pollard's rho algorithm to solve the discrete logarithm problem. Apply discrete logarithm algorithms in cryptographic protocols like Diffie-Hellman key |

exchange.

5. Prime Number Generation:

- a. Develop algorithms to generate prime numbers of desired lengths.
- b. Implement primality tests such as the Miller-Rabin test or the AKS primality test to verify the primality of generated numbers.
- c. Use prime number generation in cryptographic algorithms for key generation and parameter selection.

6. GCD and Extended Euclidean Algorithm:

- a. Implement algorithms to calculate the greatest common divisor (GCD) of two numbers.
- b. Use the extended Euclidean algorithm to find modular inverses and solve linear Diophantine equations.
- c. Apply GCD and the extended Euclidean algorithm in cryptographic protocols like RSA for key generation.

7. Statistical Analysis:

- a. Study statistical techniques for analyzing cryptographic algorithms and protocols.
- b. Implement statistical tests such as frequency analysis, chi-square test, or randomness tests to assess the quality of random number generators.
- c. Use statistical analysis to evaluate the security and robustness of cryptographic systems against various attacks.

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Semester-VI

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| Course code: AIM23PCL351 Course name: Convolutional Neural Networks Course category: PCC |
| Credits: 3 Teaching scheme: L-3 Hrs/Week Evaluation scheme: CA-40, MSE-20, ESE-40 |
| Duration of Theory Exam: 2 Hrs |
| Pre-requisites: Basic Knowledge of Artificial Neural Networks |
| Course Objectives: |
| 1. To understand the theoretical foundations, algorithms and methodologies of Neural Network. |
| 2. To familiarize deep learning concepts with Convolutional Neural Network case studies. |
| 3. To design and develop an application using specific deep learning models. |
| Course Outcomes: At the end of the course, the students will be able to - |
| CO1: Understand the role of Deep learning in Machine Learning Applications. |
| CO2: Apply appropriate deep learning algorithms for analyzing the data for a variety of problems. |
| CO3: Design and implement Convolutional Neural Networks. |
| CO4: Execute performance metrics of Deep Learning Techniques. |
| CO5: Design and implement Deep Learning Applications. |

Contents –

| Unit | Content | Teaching hours |
|------|--|----------------|
| 1 | Machine Learning Basics - Learning algorithms, Maximum likelihood estimation, Building machine learning algorithm, Neural Networks Multilayer Perceptron, Back-propagation algorithm and its variants Stochastic gradient descent, Curse of Dimensionality. | 9 |
| 2 | Deep Learning Architectures - Machine Learning and Deep Learning, Representation Learning, Width and Depth of Neural Networks, Activation Functions: RELU, LRELU, ERELU, Unsupervised Training of Neural Networks, Restricted Boltzmann Machines, Auto Encoders, Deep Learning Applications | 9 |
| 3 | Convolutional Neural Networks - Neurons in Human Vision, The Shortcomings of Feature Selection, Vanilla Deep Neural Networks, Filters and Feature Maps, Full Description of the Convolutional Layer, Max Pooling, Full Architectural Description of Convolution Networks, Closing the Loop on MNIST with Convolutional Networks, Image Preprocessing Pipelines Enable More Robust Models. | 9 |
| 4 | Popular CNN Architectures - ResNet, AlexNet – Applications. Transfer learning Techniques, – Image Classification using Transfer Learning. Variants of CNN: DenseNet, PixelNet | 9 |
| 5 | Sequence Modeling - Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks. Long short-term memory. | 9 |

Text Books:

1. James Stewart, Calculus Early Transcendental, 7th edition, Cengage.

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| 2. George B. Thomas, Ross L. Finney, Calculus and Analytical Geometry, 9 th edition, Pearson. |
| 3. Howard Anton, Irl Bivens, Stephens Davis, Calculus, 10 th Edition, Wiley. |
| |
| Reference Books: |
| 1. Shanti Narayan, Differential Calculus, S. Chand & Co. |
| 2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, New York. |
| 3. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi. |
| 4. P. N. Wartikar, J. N. Wartikar, Applied Mathematics (Vol I & II) , Pune Vidyarthi Griha Prakashan, Pune. |
| 5. H. K. Das and Rajnish Verma, Higher Engineering Mathematics , S. Chand & CO. Pvt. Ltd., New Delhi. |
| 6. K. D Joshi, Calculus for Scientists and Engineers, CRC Press. |
| 7. Prasad and Reena Garg, Advanced Engineering Mathematics, Khanna Publishing Company Private Limited, New Delhi. |
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| Online Resources: 1. NPTEL / SWAYAM lectures. |
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Semester – VI

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| Course code: DSC23PCL352 Course name: Computer Vision and Pattern Recognition |
| Course category: PCC |
| Credits: 3 Teaching scheme: L-3 Hrs/Week Evaluation scheme: CA-40, MSE-20, ESE-40 |
| Duration of Theory Exam: 2 Hrs |
| Pre-requisites: 1.Image processing 2.Programming logic and design 3.Any programming language like C/C++/Java/Python/Matlab |
| Course Objectives: |
| 1. Understand computer vision and pattern recognition concepts, technologies, and algorithms. |
| 2. Understand the underlying principle of Computer Vision and its usage in various applications. |
| 3. Understand the underlying principle of Pattern Recognition and its usage in various applications. |
| Course Outcomes: At the end of the course, the students will be able to - |
| CO1: Implement fundamental image processing techniques required for computer vision. |
| CO2: Identify various approaches of computer vision and pattern recognition. |
| CO3: Able to apply a variety of techniques and relevant knowledge for solving problems in computer vision and pattern recognition. |

Contents:-

| Unit | Content | Teaching hours |
|------|--|----------------|
| 1 | Introduction to computer vision- Sensing, seeing, and perceiving, Role of vision, Images, Sources of imagery, The physics of imaging. Geometry of Image Formation, Representing, acquiring, and displaying images, Grayscale, color, noise, lens distortion, and filtering | 8 |
| 2 | Image classification and clustering- Image classification and clustering, Linear classification, Higher-level representations, Object detection, Bag of words, Object recognition/categorization, Segmentation, Applications: Surveillance, Object detection. | 8 |
| 3 | Introduction to Pattern Recognition- Bayes Decision Theory: Minimum-error-rate classification, Classifiers, Discriminant functions, Decision surfaces, Normal density and discriminant functions, discrete features. Linear discriminant functions: Gradient descent procedures; Perceptron; Support vector machines. | 8 |
| 4 | Parameter Estimation Methods 1- Maximum-Likelihood estimation: Gaussian case. Maximum a Posteriori estimation. Bayesian estimation: Gaussian case. Unsupervised learning and clustering - Criterion functions for clustering. Algorithms for clustering: K-Means, Hierarchical and other methods. Cluster validation | 8 |
| 5 | Parameter Estimation Methods 2- Gaussian mixture models, Expectation-Maximization method for parameter estimation. Maximum entropy estimation. Sequential Pattern Recognition. Hidden Markov Models (HMMs). | 8 |

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| Discrete HMMs. Continuous HMMs. Nonparametric techniques for density estimation. Parzen-window method. K-Nearest Neighbour method. | |
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| Text Books: 1. R.O.Duda, P.E.Hart and D.G.Stork, Pattern Classification, John Wiley, 2001 |
| 2. S.Theodoridis and K.Koutroumbas, Pattern Recognition, 4th Ed., Academic Press, 2009 |
| 3. C.M.Bishop, Pattern Recognition and Machine Learning, Springer, 2006 |
| 4. Richard Szeliski, Computer Vision Algorithms and Applications, Springer, 2010. |
| Reference Books: 1. Simon Prince, “Computer Vision: Models, Learning and Inference”, Cambridge University Press, 2012 |
| 2.Robert Schalkoff. “Digital Image Processing and Computer Vision”, Wiley and sons, 1989 |
| 3. Manas Kamal Bhuyan, “Computer Vision and Image Processing Fundamentals and Applications” CRC press 2019. |
| 4. Wang, Chen, Pau. “Handbook of Pattern Recognition and Computer Vision”. World Scientific Pub Co . 1993. |
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| Online Resources: |
| 1. NPTEL / SWAYAM lectures. |
| 2. Coursera courses on Computer Vision and Pattern Recognition. |
| 3. Edu courses on Computer Vision and Pattern Recognition |
| 4. Udemy courses on Computer Vision and Pattern Recognition. |

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Semester-VI

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|--|--|---|
| Course code: AIM23PCL352 | Course name: Data Visualization | Course category: PCC |
| Credits: 2 | Teaching scheme: L-2 Hrs/Week | Evaluation scheme: CA-40, MSE-20, ESE-40 |
| Duration of Theory Exam: 2 Hrs | | |
| Pre-requisites: Computer Graphics and Image Processing | | |
| Course Objectives: | | |
| 1. Understand the key techniques and theory used in Data Visualization. | | |
| 2. Identify appropriate data visualization techniques given particular requirements imposed by the data | | |
| 3. Apply Data Visualizations techniques to basic data sets. | | |
| 4. Present data with visual representations for your target audience | | |
| Course Outcomes: At the end of the course, the students will be able to - | | |
| CO1: Understand the key techniques and theory used in Data Visualization. | | |
| CO2: Identify appropriate data visualization techniques given particular requirements imposed by the data | | |
| CO3: Apply Data Visualizations techniques to basic data sets. | | |
| CO4: Present data with visual representations for your target audience | | |

Contents –

| Unit | Content | Teaching hours |
|------|---|----------------|
| 1 | Introduction- What is beauty in the context of visualization, The Importance of Storytelling in Information Visualization, Question + Visual Data + Context = Story; The importance of context: Exploratory vs. explanatory analysis, Who, What and How. | 6 |
| 2 | Steps for Creating an Effective Visualization- Steps for Creating an Effective Visualization, Classifications of Visualizations: Complexity, Infographics versus Data Visualization, choosing an effective visual, Exploration versus Explanation, Informative versus Persuasive versus Visual Art. | 6 |
| 3 | Ingredients of Successful Visualizations- Ingredients of Successful Visualizations: Designer, Reader, Data; Determine Your Goals and Supporting Data: Knowledge Before Structure, Avoiding TMI; Choosing Appropriate Visual Encodings, Selecting Structure Position: Layout and Axes, The Meaning of Placement and Proximity, Patterns of Organization. | 6 |
| 4 | Visualization of groups Visualization of groups, trees, graphs, clusters, networks, software, Metaphorical visualization Visualization tools- Tableau, PowerBI. | 6 |
| 5 | Visualization of Data Visualization of volumetric data, vector fields, processes and simulations, Visualization of maps, geographic information, GIS systems, collaborative visualizations, evaluating visualizations. | 6 |

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| Text Books: |
| 1. Designing Data Visualizations: Representing Informational Relationships by Noah Iliinsky and Julie Steele, Published by O'Reilly Media, Inc. |
| 2. Storytelling with Data: A Data Visualization Guide for Business Professionals by Cole NussbaumerKnaflie, Published by John Wiley & Sons, Inc., Hoboken, New Jersey. |
| 3. Beautiful Visualization: Looking at Data through the Eyes of Experts (Theory in Practice) by Julie Steele and Noah Iliinsky, Published by O'Reilly Media, Inc. |
| Reference Books: |
| 1. Data Visualization and Exploration with R: A practical guide to using R, RStudio, and Tidyverse for data visualization, exploration, and data science applications by Eric Pimpler – Geospatial Training Services. |
| 2. E. Tufte, The Visual Display of Quantitative Information, Graphics Press.2nd Edition, 2001. |
| 3. Ward, Grinstein Keim, Interactive Data Visualization: Foundations, Techniques, and Applications. Natick: A K Peters, Ltd. 1st Edition, 2014. |
| 4. Kieran Healy, Data Visualization: A Practical Introduction, sew Edition, 2013 |
| 5. Andy Krik, Data Visualization: a successful design process 1st Edition, 2016 |
| Online Resources: 1. NPTEL / SWAYAM lectures. |
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MGMUNIVERSITY

Semester-VI

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|---|--------------------------------------|--|
| Course code: AIM23PCP351 Course name: Convolutional Neural Network Lab | | |
| Course category: PCC | | |
| Credits: 1 | Teaching scheme: P-2 Hrs/Week | Evaluation scheme: TW-30, PR-20 |
| Pre-requisites: Basics knowledge of Artificial Neural Networks | | |
| Lab Objectives: | | |
| 1.To get hands-on experience using TensorFlow and Keras to implement deep learning models. | | |
| 2.To use deep learning techniques to solve real-world problems, including regression tasks, image classification | | |
| Lab Outcomes: At the end of the course, the students will be able to - | | |
| LO1: Train the model on a given dataset and evaluate its performance using loss functions and metrics like Mean Squared Error (MSE). | | |
| LO2: Design and implement a Convolutional Neural Network (CNN) for image classification. | | |
| LO3: Implement a simple LSTM model to process sequential data for tasks like time-series prediction or sequence classification. | | |
| LO4: Implement object detection models like Faster R-CNN or YOLO using TensorFlow/Keras | | |

List of Experiments

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| 1. Implement Simple Programs like vector addition in TensorFlow. |
| 2. Implement a simple problem like a regression model in Keras. |
| 3. Implement a perceptron in TensorFlow/Keras Environment. |
| 4. Implement a Feed-Forward Network in TensorFlow/Keras. |
| 5. Implement an Image Classifier using CNN in TensorFlow/Keras. |
| 6. Implement a Transfer Learning concept in Image Classification. |
| 7. Implement an Autoencoder in TensorFlow/Keras. |
| 8. Implement a Simple LSTM using TensorFlow/Keras. |
| 9. Implement an Object Detection using CNN. |
| 10. Recommendation system from sales data using Deep Learning |

Semester-VI

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| Course code: AIM23PCP352 | Course name: Data Visualization Lab | Course category: PCC |
| Credits: 1 | Teaching scheme: P-2 Hrs/Week | Evaluation scheme: TW-30, PR-20 |
| Pre-requisites: Basic Knowledge of Data Analysis and R Programming. | | |
| Lab Objectives: | | |
| 1. Load, transform, and tidy data in R for analysis. | | |
| 2. Apply basic and advanced data visualization techniques in R, including geographic visualization with ggmap. | | |
| 3. Analyze real-world case studies using R, focusing on data exploration and visualization. | | |
| Lab Outcomes: At the end of the course, the students will be able to - | | |
| LO1: Load, clean, and organize data effectively using R. | | |
| LO2: Create and interpret basic and advanced visualizations in R. | | |
| LO3: Apply data exploration and visualization techniques to real-world case studies. | | |

List of Experiments

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| 1. The Basics of Data Exploration and Visualization with R |
| 2. Loading Data in R |
| 3. Transforming Data in R |
| 4. Creating Tidy Data |
| 5. Data Exploration in R |
| 6. Basic Data Visualization Techniques in R |
| 7. Visualizing Geographic Data with ggmap |
| 8. R Markdown |
| 9. Case Study – Wildfire Activity in the Western United States |
| 10. Case Study – Single Family Residential Home and Rental Values |

Semester-VI

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|---|--|---|
| Course code: ITY23PEL352 | Course name: IOT Communications | Course category: PEC |
| Credits: 3 | Teaching scheme: L-3 Hrs/Week | Evaluation scheme: CA-40, MSE-20, ESE-40 |
| Duration of Theory Exam: 2 Hrs | | |
| Pre-requisites: | | |
| <ol style="list-style-type: none"> 1. Basics of Electrical and Electronics 2. Basics of Digital Electronics, Microcontroller and Internet Networking | | |
| Course Objectives: | | |
| <ol style="list-style-type: none"> 1. To understand the basics of the Internet of Things (IoT) and the protocols that enable communication between devices. 2. To learn about the middleware architecture used in IoT systems for efficient data management and device integration. 3. To explore real-world application areas of IoT across industries such as healthcare, smart homes, and transportation. | | |

Course Outcomes: At the end of the course, the students will be able to -

CO1: Acquaint the basics and Applications of Internet of Things

CO2: Explore an architecture and Protocols of an IoT

CO3: Design of Embedded Systems with Arduino

CO4: Explore design methodology using Sensors and Actuators

CO5: Do Programming with Python for IOT

CO6: Interface with Raspberry Pi communication

Contents –

| Unit | Content | Teaching hours |
|------|---|----------------|
| 1 | INTRODUCTION TO IOT- Understanding Internet of Things Fundamentals, IoT Architecture and Protocols, Functional blocks of an IoT ecosystem, Sensors, Actuators, Smart Objects and Connecting Smart Object. Real time Applications, Challenges in IOT | 8 |
| 2 | EMBEDDED SYSTEMS WITH ARDUINO- Arduino Uno architecture, Setup the IDE, Writing Arduino Software, Arduino Libraries, Basics of Embedded C programming for Arduino, Interfacing LED, Push button and buzzer with Arduino with LCD | 8 |
| 3 | Sensor and Actuators - Overview of sensors working, Analog and Digital Sensors, Interfacing of temperature , Humidity, Motion, Light Gas Sensors with Arduino, Interfacing of Actuators with Arduino, Interfacing of Relay Switch and Servo motor with Arduino | 8 |
| 4 | Scripting Language Python for IOT Communication- Python functions, Setting up the pins, General purpose IO Pins, Protocol Pins, Python on Raspberry Pi, GPIO Access, Accessing pins through a Graphic User Interface. | 8 |
| 5 | Interfacing Hardware with Raspberry Pi for IOT Applications- | 8 |

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| | Basic functionality of Raspberry Pi Board, Setting up the Board, configuration and use, Downloading an Operating System, format SD card, Booting OS, Basics of Linux, Main features including Navigating the file System . | |
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| Text Books: | | |
| 1. | Internet of Things – A hands-on approach, Arshdeep Bahga, Vijay Madiseti, Universities Press, 2015 | |
| 2. | Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education | |
| 3. | Internet of Things with Raspberry Pi and Arduino by Rajesh Singh, Anita Gehlot, Lovi raj Gupta, Bhupendra Singh, Mahendra ISBN9780367248215 by CRC Press | |
| Reference Books: | | |
| 1. | Eben Upton and Gareth Halfacree, “Raspberry Pi User Guide”, 4 th Edition, John Wiley & Sons | |
| 2. | Alex Bradbury and Ben Everard, ”Learning Python with Raspberry Pi” John Wiley & Sons | |
| Online Resources: 1. NPTEL / SWAYAM lectures. | | |
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Semester-VI

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|---|---|---|
| Course code: AIM23PEL351 | Course name: Knowledge Engineering (Elective-II) | Course category: PEC |
| Credits: 3 | Teaching scheme: L-3 Hrs/Week | Evaluation scheme: CA-40, MSE-20, ESE-40 |
| Duration of Theory Exam: 2 Hrs | | |
| Pre-requisites: Basic Understanding of Artificial Intelligence and Programming | | |
| Course Objectives: | | |
| 1. This course provides an in-depth introduction to knowledge engineering | | |
| 2. Students will learn the principles and techniques of knowledge representation, knowledge acquisition, knowledge-based systems, and knowledge management. | | |
| Course Outcomes: At the end of the course, the students will be able to - | | |
| CO1: Understand the principles and techniques of knowledge engineering. | | |
| CO2: Develop knowledge-based systems using knowledge representation and inference techniques. | | |
| CO3: Apply machine learning techniques for knowledge acquisition. | | |
| CO4: Apply knowledge management techniques to improve the usability and maintainability of knowledge-based systems. | | |
| CO5: Analyze and evaluate knowledge-based systems and their applications in different domains. | | |

Contents –

| Unit | Content | Teaching hours |
|------|---|----------------|
| 1 | Introduction to Knowledge Engineering- Overview of knowledge engineering, Historical perspective and evolution of knowledge engineering, Applications of knowledge engineering, Knowledge representation and reasoning. | 8 |
| 2 | Knowledge Representation- Semantic networks, Frames, Rule-based systems, Ontologies, Ontological dependence, identity, modality, substances. | 8 |
| 3 | Knowledge Acquisition- Introduction to knowledge acquisition, Knowledge elicitation techniques, Machine learning for knowledge acquisition, Knowledge validation and verification. | 9 |
| 4 | Knowledge-based Systems- Introduction to knowledge-based systems, Expert systems, Decision support systems, Case-based reasoning, Fuzzy logic systems. | 8 |
| 5 | Applications of Knowledge Engineering- Applications of knowledge engineering in different domains, Evaluation and analysis of knowledge-based systems, Ethical and social implications of knowledge engineering, A case study on any one application. | 9 |

Text Books:

1. An Introduction to Knowledge Engineering by Simon Kendal, Malcolm Creen, Springer
2. Knowledge Engineering: Building Cognitive Assistants for Evidence-based Reasoning Hardcover – 8 September 2016 by David A. Schum, Dorin Marcu , Gheorghe Tecuci , Mihai Boicu.

Reference Books:

1. Knowledge Representation: Logical, Philosophical, and Computational Foundations John F. Sowa, August 17, 1999

Online Resources:

1. <https://www.techtargget.com>
2. <https://www.javatpoint.com/ai-knowledge-engineering-in-first-order-logic>
3. <https://www.engati.com/glossary/knowledge-engineering>

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Semester-VI

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|---|---|---|
| Course code: AIM23PEL352 | Course name: Cryptography and Data Compression | Course category: PEC |
| Credits: 3 | Teaching scheme: L-3 Hrs/Week | Evaluation scheme: CA-40, MSE-20, ESE-40 |
| Duration of Theory Exam: 2 Hrs | | |
| Pre-requisites: Linear algebra | | |
| Course Objectives: | | |
| 1. To have the knowledge of security, types of attack experienced, encryption and authentication for deal with attacks. | | |
| 2. To have knowledge what is data compression, needs and techniques of data compression. | | |
| Course Outcomes: At the end of the course, the students will be able to - | | |
| CO1: Understand plain text, cipher text, and cryptographic algorithms, including RSA. | | |
| CO2: Implement key distribution methods and communication models in cryptography. | | |
| CO3: Implement various data compression models and their applications. | | |

Contents –

| Unit | Content | Teaching hours |
|------|---|----------------|
| 1 | Introduction to Security - Need for security, Security approaches, Principles of security, Types of attacks. Encryption Techniques: Plaintext, Cipher text, Substitution & Transposition techniques, Encryption & Decryption, Types of attacks, Key range & Size. | 9 |
| 2 | Symmetric & Asymmetric Key Cryptography - Algorithm types & Modes, DES, IDEA, Differential & Linear Cryptanalysis, RSA, Symmetric & Asymmetric key together, Digital signature, Knapsack algorithm. | 9 |
| 3 | Case Studies of Cryptography - Denial of service attacks, IP spoofing attacks, Conventional Encryption and Message Confidentiality, Conventional Encryption Algorithms, Key Distribution. Public Key Cryptography and Message Authentication: Approaches to Message Authentication, SHA-1, MD5, Public-Key Cryptography Principles, RSA, Digital, Signatures, Key Management, Firewall | 9 |
| 4 | Introduction to data compression- Need for data compression, Fundamental concept of data compression & coding, Communication model, Compression ratio, Requirements of data compression, Classification. Methods of Data Compression: Data compression-- Lossless & Lossy. | 9 |
| 5 | Recent Trends- Recent trends in encryption and data compression techniques. | 9 |

Text Books:

1. Cryptography and Network Security, Mohammad Amjad, John Wiley & Sons
2. Cryptography & Network Security by Atul Kahate, TMH.

Reference Books:

1. Information Theory and Coding, Muralidhar Kulkarni, K S Shivaprakasha, John Wiley & Sons.

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| 2. Cryptography and Network Security by B. Forouzan, McGraw-Hill. |
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| 3. The Data Compression Book by Nelson, BPB. |
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| Online Resources: 1. NPTEL / SWAYAM lectures. |
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Semester-VI

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|--|---|--|
| Course code: ITY23PEP352 | Course name: EL-II: IoT Communications - Lab | Course category: PEC |
| Credits: 1 | Teaching scheme: P-2 Hrs/Week | Evaluation scheme: TW–30, PR–20 |
| Pre-requisites: Basics of Electrical and electronics | | |
| Lab Objectives: | | |
| 1. To learn about communication devices like Sensors and Actuators.in IoT. | | |
| 2. To implement basic IoT Communication systems using various Sensors and Actuators | | |
| 3. To understand the System designs with Arduino and Raspberry Pi | | |
| Lab Outcomes: At the end of the course, the students will be able to - | | |
| LO1: Set up and configure an Arduino and Raspberry Pi for communication in IoT | | |
| LO2: Gain practical experience in using various IoT communication protocols. | | |
| LO3: Understand the strengths and weaknesses of different protocols for real-time IoT applications. | | |

List of Experiments

| Sr. No. | Name of Practical |
|---------|---|
| 1 | Introduction to IoT Fundamentals: Explore the basic concepts of the Internet of Things (IoT), IoT architecture, protocols, and functional blocks of an IoT ecosystem. |
| 2 | Exploring IoT Communication Devices: Learn and implement communication systems with LED, Push Button Switch. |
| 3 | Understanding Embedded Systems with Arduino: Get hands-on experience with the Arduino Uno architecture, setup, programming in Embedded C, and basic interaction with sensors and actuators. |
| 4 | Interfacing Sensors with Arduino: Interface various sensors (temperature, humidity, motion, light) with Arduino. Learn how to process and display sensor data using Arduino IDE. |
| 5 | Interfacing Actuators with Arduino: Interface and control actuators like relays and servo motors with Arduino. Write programs to control actuator behavior based on sensor input. |
| 6 | Python for IoT Communication: Learn how to use Python for controlling GPIO pins on Raspberry Pi, and implementing the same . |
| 7 | Interfacing Hardware with Raspberry Pi: Set up Raspberry Pi, install necessary OS, and interface it with various sensors and actuators. Create a basic IoT application that involves hardware communication. |
| 8 | Real-Time IoT Application and Challenges: Develop a real-time IoT application, addressing practical challenges such as data latency, network issues, security concerns, and power management. |

Semester-VI

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|---|--|--|---|--|--|--|--|--|
| Course code: AIM23PEP351 | | | Course name: Knowledge Engineering Lab | | | Course category: PEC | | |
| Credits: 1 | | | Teaching scheme: P-2 Hrs/Week | | | Evaluation scheme: TW-30, PR-20 | | |
| Pre-requisites: Basic Understanding of Artificial Intelligence and Programming Techniques. | | | | | | | | |
| Lab Objectives: | | | | | | | | |
| 1. Build and populate a knowledge base using information extraction and NLP. | | | | | | | | |
| 2. Develop reasoning algorithms and evaluate knowledge-based systems. | | | | | | | | |
| 3. Experiment with knowledge base visualization, evolution, and real-world case studies. | | | | | | | | |
| Lab Outcomes: At the end of the course, the students will be able to - | | | | | | | | |
| LO1: Extract and structure data to create knowledge bases. | | | | | | | | |
| LO2: Implement reasoning algorithms and build knowledge-based systems. | | | | | | | | |
| LO3: Apply knowledge engineering to real-world case studies. | | | | | | | | |

List of Experiments: Design, develop and implement the following Assignments

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| 1. Create a knowledge base by extracting information from different sources, such as documents, databases, or websites. |
| 2. Develop techniques to automatically populate a knowledge base with new information from unstructured or semi-structured data, such as text documents or social media posts, using techniques like natural language processing (NLP) and information extraction (IE). |
| 3. Develop reasoning algorithms to infer new knowledge from existing knowledge in the knowledge base. |
| 4. Build and evaluate knowledge-based systems, such as question answering systems, recommendation systems, or expert systems. |
| 5. Experiment with techniques for managing and updating knowledge in the knowledge base over time, such as knowledge evolution, knowledge revision to keep the knowledge base up-to-date and relevant. |
| 6. Experiment with different visualization techniques to represent and visualize knowledge in the knowledge base, such as graphs, charts, or interactive visualizations. |
| 7: A Case Study in Engineering a Knowledge Base for an Intelligent Personal Assistant |
| 8: Case Study: Knowledge Engineering in a Real World Case-Based Reasoning Application |
| 9: Case Study: Knowledge Engineering Process in AI with example |
| 10: Case Study: Comparing machine learning to knowledge engineering for student behavior modeling: A case study in gaming the system. |

Semester-VI

| | | | |
|--|--------------------------------------|---|--|
| Course code: AIM23PEP352 | | Course name: Cryptography and Data Compression Lab | |
| Course category: PEC | | | |
| Credits: 1 | Teaching scheme: P-2 Hrs/Week | Evaluation scheme: TW-30, PR-20 | |
| Pre-requisites: Basic Knowledge of Cryptography and Programming. | | | |
| Lab Objectives: | | | |
| 1. Develop a hybrid encryption program combining symmetric (AES) and asymmetric (RSA) techniques for secure communication. | | | |
| 2. Implement data compression and encryption together, optimizing storage and transmission. | | | |
| 3. Create an encrypted archive tool integrating compression and encryption, and evaluate its performance. | | | |
| Lab Outcomes: At the end of the course, the students will be able to - | | | |
| LO1: Implement hybrid encryption schemes combining symmetric and asymmetric algorithms for secure data communication. | | | |
| LO2: Apply data compression techniques to encrypted data and evaluate size and security. | | | |
| LO3: Develop and assess tools that combine encryption and compression for efficient data storage and transmission. | | | |

List of Experiments

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| 1. Hybrid Encryption: <ol style="list-style-type: none"> a. Develop a program that combines symmetric and asymmetric encryption techniques for secure communication. b. Use asymmetric encryption (e.g., RSA) to exchange a symmetric encryption key securely. |
| 2. Implement symmetric encryption (e.g., AES) to encrypt the actual data efficiently. |
| 3. Evaluate the performance and security of the hybrid encryption scheme. |
| 4. Compressed Cryptography: <ol style="list-style-type: none"> a. Explore techniques for integrating data compression with encryption to optimize storage and transmission. b. Develop a program that compresses plaintext data using algorithms like Huffman coding or LZ77. |
| 5. Apply encryption to the compressed data using symmetric encryption (e.g., AES). Compare the size and security of the compressed ciphertext with uncompressed ciphertext. |
| 6. Encrypted Archive Tool: <ol style="list-style-type: none"> a. Create a tool for creating encrypted archives that combine compression and encryption functionalities. b. Allow users to select files or directories for compression and encryption. |

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| 7. Implement encryption using a symmetric cipher like AES with a user-provided passphrase. |
| 8. Evaluate the efficiency of the tool by comparing the size of encrypted archives with and without compression. |

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Semester-VI

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|--|--------------------------------------|---|
| Course code: ITY23PEL355 | Course name: IoT Networking | Course category: PEC |
| Credits: 3 | Teaching scheme: L-3 Hrs/Week | Evaluation scheme: CA-40, MSE-20, ESE-40 |
| Duration of Theory Exam: 2 Hrs | | |
| Pre-requisites: | | |
| 1. Arduino & Raspberry Pi Controller Programming | | |
| 2. Networking Technologies | | |
| 3. Fundamentals of computer network, | | |
| 4. Network Security & Internet technology | | |
| Course Objectives: | | |
| 1. To understand the various IoT Protocols | | |
| 2. To networking Between the devices | | |
| 3. To study of IoT Network Architecture | | |
| 4. To study Smart IoT Connected Cities | | |
| Course Outcomes: At the end of the course, the students will be able to - | | |
| CO1: Interface Arduino with wireless devices | | |
| CO2: Explore the smart objects | | |
| CO3: Connect the smart objects with IT | | |
| CO4: Explore the IoT Network Architecture | | |

Contents –

| Unit | Content | Teaching hours |
|------|---|----------------|
| 1 | Arduino Interface Arduino-Ethernet Interface, Connect Arduino using the Ethernet, Ethernet Library, Simple Ethernet Client Example, Simple Ethernet Server Interface Example, Arduino using the Wi-Fi Connect Arduino using the Wi-Fi WiShield Library, WiFly Shield Library, Using the Arduino Library for Processing. | 8 |
| 2 | - Basic Networking with ESP8266 WI-Fi module- Basics of Wireless Networking Introduction to ESP8266, Various Wi-Fi library, Web server- introduction, installation, configuration. Posting sensor(s) data to web server, Introduction to ESP8266 NodeMCU Module , Pin out, Block diagram | 8 |
| 3 | IP as the IoT network Layer - Key advantages of Internet protocol, Adoption or Adaptation of the Internet Protocol, Need for Optimization, Optimizing IP for IoT. | 8 |
| 4 | Connecting smart objects - Communication Criteria, IoT Access Technologies, IEEE 82.15.4, Standardization and alliances, Physical Layer, MAC Layer, topology Security | 8 |
| 5 | Smart and connected cities and Public safety- An IoT Strategy for smarter cities, Smart city architecture, Smart city Security architecture, Smart city use case example. | 8 |

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| Text Books: |
| 1. Vijay Madiseti, Arshdeep Bahga, “Internet of Things: A Hands-On Approach” Orient Blackswan Pvt. Ltd., New Delhi, 2015 |
| Reference Books: |
| 1. IoT Fundamentals: Networking Technologies, Protocols and Use Cases for the Internet of Things by Pearson Paperback — 16 Aug 2017 by Hanes David (Author), Salgueiro Gonzalo (Author), Grossetete Patrick (Author), Barton Rob |
| 2. Internet of Things with Raspberry Pi and Arduino By Rajesh Singh, Anita Gehlot, Lovi Raj Gupta, Bhupendra Singh, Mahendra Swain, ISBN 9780367248215, Published November 12, 2019 by CRC Press |
| 3. IoT (Internet of Things) Programming: A Simple and Fast Way of Learning, 10T Kindle Edition by David Etter (Author) Format: Kindle Edition |
| Online Resources: NPTEL / SWAYAM lectures. |

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Semester-VI

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|---|--|---|
| Course code: AIM23PEL353 | Course name: Speech Recognition | Course category: PEC |
| Credits: 3 | Teaching scheme: L-3 Hrs/Week | Evaluation scheme: CA-40, MSE-20, ESE-40 |
| Duration of Theory Exam: 2 Hrs | | |
| Pre-requisites: Advance Python Programming | | |
| Course Objectives: | | |
| 1. Make the students understand the fundamental theory of speech recognition. | | |
| 2. Enable them to recognize the various components of speech recognition systems. | | |
| Course Outcomes: At the end of the course, the students will be able to - | | |
| CO1: To describe the components and building blocks of an automatic speech recognition system. | | |
| CO2: To identify the models for designing a speech recognition system. | | |
| CO3: To elaborate on various techniques used for acoustic modelling. | | |
| CO4: To explore recent learning approaches for speech recognition. | | |

Contents –

| Unit | Content | Teaching hours |
|------|--|----------------|
| 1 | Introduction- Introduction to Speech Recognition, History of Speech Recognition, Statistical Speech Recognition, Articulatory phonetics, Acoustics, ARPAbet transcription | 9 |
| 2 | Automatic Speech Recognition - Noisy channel model, Word error rate metrics, Acoustic modelling, Feature extraction, Decoding, Finite-state transducers. | 9 |
| 3 | HMM for Acoustic Modelling- Markov Chains, Architecture of an HMM-Based Recognizer, HMM Algorithms, Gaussian Mixture Models, Weighted finite-state transducers in speech recognition | 9 |
| 4 | Neural network acoustic models- Introduction, Hybrid HMM systems, Context-dependent DNNs, TDNNs and LSTMs | 9 |
| 5 | Machine Learning in Dialog- Dialog systems overview, Dialog system design. GUS and frame-based dialog systems. Alexa Skills Kit | 9 |

Text Books:

1. Dan Jurafsky and James H. Martin, “Speech and Language Processing”, 3rd edition draft, 2020

Reference Books:

1. Lawrence Rabiner, Biing-Hwang Juang, B. Yegnanarayana, “Fundamentals of Speech Recognition”, Pearson Education, 2008

2. Homayoon Beigi, “Fundamentals of Speaker Recognition”, Springer, 2011

Online Resources:

1. <https://web.stanford.edu/class/cs224s/>
2. <http://www.inf.ed.ac.uk/teaching/courses/asr/index-2021.html>
3. <https://www.cse.iitb.ac.in/~pjyothi/cs753/index.html>

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Semester-VI

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|--|--|---|
| Course code: AIM23PEL354 | Course name: Steganography and Digital Watermarking | Course category: PEC |
| Credits: 3 | Teaching scheme: L-3 Hrs/Week | Evaluation scheme: CA-40, MSE-20, ESE-40 |
| Duration of Theory Exam: 2 Hrs | | |
| Pre-requisites: | | |
| Course Objectives: | | |
| 1. To provide an insight to steganography techniques and watermarking methods. | | |
| 2. To explore attacks on data hiding and ensure data integrity. | | |
| Course Outcomes: At the end of the course, the students will be able to - | | |
| CO1: Explore watermarking techniques and understand the concept through examples. | | |
| CO2: Learn the concept of information hiding. | | |
| CO3: Survey current steganography techniques and understand how to detect and extract hidden information. | | |

Contents –

| Unit | Content | Teaching hours |
|------|---|----------------|
| 1 | Introduction - Steganography: Overview, History, Methods for hiding (text, images, audio, video, speech etc.). Steganalysis: Active and Malicious Attackers, Active and passive Steganalysis. | 9 |
| 2 | Automatic Speech Recognition- Frameworks for secret communication (pure steganography, secret key, public key steganography), Steganography algorithms (adaptive and non-adaptive). | 9 |
| 3 | HMM for Acoustic Modelling - Steganography techniques: Substitution systems, Spatial Domain, transform domain techniques, Spread spectrum, Statistical steganography, Detection, Distortion, Techniques: LSB Embedding, LSB Steganalysis using primary sets | 9 |
| 4 | Neural network acoustic models- Digital Watermarking: Introduction, Difference between Watermarking and Steganography, Classification (Characteristics and Applications), types and techniques (Spatial-domain, Frequency-domain, and Vector quantization based watermarking), Watermark security & authentication | 9 |
| 5 | Machine Learning in Dialog - Recent trends in Steganography and digital watermarking techniques. Case study of LSB Embedding, LSB Steganalysis using primary sets. | 9 |

Text Books:

- Peter Wayner, “Disappearing Cryptography – Information Hiding: Steganography & Watermarking”, Morgan Kaufmann Publishers, New York, 2002
- Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, Jessica Fridrich, TonKalker, “Digital Watermarking and Steganography”, Margan Kaufmann Publishers, New York, 2008.

Reference Books:

- Information Hiding: Steganography and Watermarking-Attacks and Countermeasures

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|--|
| by Neil F. Johnson, Zoran Duric, Sushil Jajodia. |
| 2. Information Hiding Techniques for Steganography and Digital Watermarking by Stefan Katzenbeisser, Fabien A. P. Petitcolas. |
| |
| Online Resources: 1. NPTEL / SWAYAM lectures. |
| 1. Cyber Security, https://swayam.gov.in/nd2_cec20_cs09/preview . |
| 2. Introduction to Cyber Security, https://swayam.gov.in/nd2_nou20_cs01/preview |

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Semester-VI

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|---|--|--|
| Course code: ITY23PEP355 | Course name: IOT Networking-Lab | Course category: PEC |
| Credits: 1 | Teaching scheme: P-2 Hrs/Week | Evaluation scheme: TW-30, PR-20 |
| Pre-requisites: Basics of IoT, microcontrollers | | |
| Lab Objectives: | | |
| 1. To understand the fundamentals of interfacing sensors and modules with Arduino for real-time data acquisition. | | |
| 2. To develop and implement IoT applications using Arduino with various communication modules. | | |
| 3. To design and configure web-based applications using Arduino for remote monitoring and control. | | |
| 4. To integrate cloud platforms like ThingSpeak and Blynk for data visualization and analytics. | | |
| 5. To demonstrate the ability to troubleshoot and optimize IoT-based systems. | | |
| 6. To apply Arduino programming techniques to develop automated solutions for real-world problems. | | |
| Lab Outcomes: At the end of the course, the students will be able to - | | |
| LO1: Interface sensors and communication modules with Arduino to acquire and transmit real-time data. | | |
| LO2: Develop and deploy web-based and mobile-based IoT applications using cloud platforms like ThingSpeak and Blynk. | | |
| LO3: Implement IoT communication using WiFi, Ethernet, and GSM modules for remote monitoring and control. | | |
| LO4: Troubleshoot and optimize hardware and software components in IoT-based systems. | | |
| LO5: Design and implement automation solutions using Arduino for real-world applications. | | |
| LO6: Document experimental results effectively through reports and presentations. | | |

List of Experiments

| Sr. No. | Name of Practical |
|---------|--|
| 1 | Arduinio connect with DHT and Ultrasonic server |
| 2 | Create a web server using Ethernet with Arduinio |
| 3 | Arduinio connects with WiFi |
| 4 | Arduinio connects with Android mobile for data transmission |
| 5 | Thing speak cloud connects to Arduino for real time data transmission in Thing speak |
| 6 | Explore the interfacing of GSM module to make gateway |
| 7 | Create Simple ESP8266 NodeMCU Webserver in Arduino IDE. |
| 8 | Creating an IoT-based weather monitoring system using sensors |

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| 9 | Pulse rate and heartbeat monitoring system using Arduino and a pulse sensor |
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Semester-VI

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| Course code: AIM23PEP353 | Course name: Speech Recognition Lab | Course category: PEC |
| Credits: 1 | Teaching scheme: P-2 Hrs/Week | Evaluation scheme: TW-30, PR-20 |
| Pre-requisites: Basic Knowledge of Speech Processing and Programming. | | |
| Lab Objectives: | | |
| 1. Build and compute probabilities for Hidden Markov Models (HMMs) using OpenFst and perform Viterbi decoding. | | |
| 2. Explore WFST operations, feature extraction, and data preparation for speech models. | | |
| 3. Train monophone and triphone models and develop speech-to-text and text-to-speech converters. | | |
| Lab Outcomes: At the end of the course, the students will be able to - | | |
| LO1: Implement and decode HMMs, applying WFST operations and probability calculations. | | |
| LO2: Prepare data, extract features, and train monophone and triphone models for speech recognition. | | |
| LO3: Develop speech-to-text and text-to-speech systems using the learned models. | | |

List of Experiments

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| 1. Build HMMs with OpenFst: Build and implement Hidden Markov Models (HMMs) using OpenFst to represent speech sequences, focusing on state transitions and output probabilities. |
| 2. Compute HMM probabilities: Compute and estimate state transition and output probabilities for HMMs using training data to model speech signal sequences. |
| 3. Viterbi decoding: Apply the Viterbi algorithm to decode the most probable sequence of states in an HMM for speech recognition tasks. |
| 4. WFST operations: Perform Weighted Finite State Transducer (WFST) operations to model the mapping of input to output in speech recognition tasks. |
| 5. Data preparation: Prepare speech data for recognition by cleaning, segmenting, and normalizing it for model training. |
| 6. Feature extraction: Extract acoustic features (e.g., MFCC) from speech data to be used in speech recognition models. |
| 7. Train monophone models: Train monophone HMM models for speech recognition, using isolated phoneme data to build basic recognition systems. |
| 8. Train triphone models: Train triphone HMM models to improve recognition accuracy by considering context-dependent phonemes. |

9. Speech-to-text converter: Develop a speech-to-text conversion system using HMMs and feature extraction to transcribe spoken words into text.

10. Text-to-speech converter: Build a text-to-speech system that generates spoken words from a given text input using synthetic speech models.

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Semester-VI

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|---|--------------------------------------|--|--|
| Course code: AIM23PEP354 | | Course name: Steganography and Digital Watermarking Lab | |
| Course category: PEC | | | |
| Credits: 1 | Teaching scheme: P-2 Hrs/Week | Evaluation scheme: TW-30, PR-20 | |
| Pre-requisites: Basic Understanding of Cryptography and Multimedia Processing | | | |
| Lab Objectives: | | | |
| 1. To implement various steganography techniques to hide and extract messages within images, audio, text, and files. | | | |
| 2. To explore digital watermarking techniques and assess the robustness of watermarked images. | | | |
| 3. To use steganalysis tools to detect hidden information and evaluate their effectiveness. | | | |
| Lab Outcomes: At the end of the course, the students will be able to - | | | |
| LO1: Apply steganography methods to embed and extract hidden messages in different media (image, audio, text, file). | | | |
| LO2: Implement watermarking techniques and evaluate their resilience against image transformations. | | | |
| LO3: Use steganalysis tools to detect hidden data and assess the effectiveness of various detection methods. | | | |

List of Experiments

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| <p>1. Image Steganography:</p> <ol style="list-style-type: none"> a. Use a steganography tool or library to hide a text message within an image file. b. Experiment with different encoding techniques (LSB, DCT, etc.) to embed the message and observe the impact on image quality. c. Try to extract the hidden message from the steganographic image and verify its accuracy. |
| <p>2. Audio Steganography:</p> <ol style="list-style-type: none"> a. Hide a short audio clip or message within a longer audio file using a steganography tool. b. Explore different methods like LSB modification in the frequency domain or spread spectrum techniques. c. Verify the successful extraction of the hidden audio message and compare it with the original. |
| <p>3. Text Steganography:</p> <ol style="list-style-type: none"> a. Conceal a secret message within a piece of text using techniques like whitespace steganography or modifying letter casing. b. Share the modified text with others and challenge them to extract the hidden message without prior knowledge |
| <p>4. File Steganography:</p> <ol style="list-style-type: none"> a. Hide a file (such as a document or an image) within another file format (like an audio or video file). b. Utilize appropriate steganography tools to embed the file and ensure its retrieval without corruption. |

5. Digital Image Watermarking:

- a. Select an image and embed a visible watermark containing your name or a logo.
- b. Explore different watermarking techniques (e.g., spatial domain, frequency domain) and compare their effectiveness.
- c. Assess the robustness of the watermark by subjecting the watermarked image to various transformations (resizing, compression, etc.).

6. Steganalysis:

- a. Use steganalysis tools or techniques to detect the presence of hidden information within steganographic images or audio files.
- b. Analyze the characteristics of steganographic content and develop strategies for detecting hidden data.
- c. Experiment with different steganalysis methods and assess their accuracy in identifying steganographic content.

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Semester-VI

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|---|--------------------------------------|--|
| Course code: ITY23VSP301 Course name: Mobile Application Development Lab Course category: VSEC | | |
| Credits: 2 | Teaching scheme: P-4 Hrs/Week | Evaluation scheme: TW-30, PR-20 |
| Pre-requisites: Fundamentals of Programming Logic | | |
| Lab Objectives: | | |
| 1. To enable the students to understand the core principles of the Object-Oriented Language | | |
| 2. To understand the concept of packages and applet programming | | |
| 3. To understand the concept of Multi-threading | | |
| 4. To understand the concept of graphic programming | | |
| 5. Introduce the students to database connectivity | | |
| Lab Outcomes: At the end of the course, the students will be able to - | | |
| LO1: Apply Object Oriented concepts to develop programs in Java. | | |
| LO2: Develop programs using packages and applet programming. | | |
| LO3: Develop programs using Inheritance, Interfaces. Multithreading. | | |
| LO4: Develop programs using graphic programming | | |
| LO5: Develop applications using databases. | | |

Contents –

| Unit | Content |
|------|---|
| 1 | Introduction To android- A little Background about mobile technologies • Android – An Open Platform for Mobile development • Native Android Application • Android SDK Features • what does Android run on? Free Additional Benefits Only At WEBCOM • Why Develop for Mobile? • Why develop for Android? • Android Development Framework • Android Application Architecture • Android Libraries |
| 2 | User Interface - •Developing for Android • First Android application Using Android Studio/Visual studio xamarin • Running and Debugging •Creating Application and Activities • Application Manifest Introduction • Android Application Life Cycle • Application Priority and process states• Fundamental Android UI Design •Study of different layouts (Linear, relative, table, absolute, frame, Constraint) • Introducing Views • Creating new Views • Draw able Resources • Creating and Using menus |
| 3 | Intent and Broadcast receiver- • I Introducing Intents • Intents and Intent filters • What are Pending Intents • Adapters • Internet Resources • Notifications • Introducing Dialogs • Saving Application Data in external and internal memory• Creating and saving preferences • Retrieving shared preferences• Creating a standard preference activity • Saving Activity State • Saving and Loading Files • Including static files as Resources • File management tools |
| 4 | Database Content Provider - Introducing Android Databases • Introducing SQLite • Cursors and content values • Working with SQLite Database • Creating new content Provider •Introduction to Firebase •Real time/ Cloud |

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|---|---|
| | •Authentication in firebase• Introduction to MySQL database •Connecting to MySQL by JSON, PHP scripts. |
| 5 | Telephony, hardware, network services, google services/map and multimedia- Telephony • Reading Phone device details • Reading Sims Details • Incoming and outgoing call monitoring• Tracking Service Change • Introducing SMS and MMS • Sending SMS and MMS • Sending SMS messages manually• Use of Bluetooth • Managing Network Connectivity • Managing Wi-Fi Google Map - Layout file • Google Map – Android Manifest file • Customizing Google Map • Adding Marker • Changing Map Type •Enable/Disable zoom• Using Sensors and Sensor Manager Interpreting sensor values • Using Compass, Accelerometer and orientation services • Controlling Device Vibration • Working with multimedia players (Audio/Video) |

Text Books/ Reference Books/ Internet Resource:

1. Hello Android: Pragmatic Bookshelf 2009
2. Professional Android Development, Wrox
3. Mobile App Development

List of Experiments: Design, develop and implement following assignments using Android Studio/ Visual studio Xamarin.

| Sr. No. | Name of Practical |
|---------|---|
| 1 | Design and develop Android Application to display “Hello World” using basic Widgets |
| 2 | Design and develop Android Application to demonstrate Activity Life Cycle |
| 3 | Design and develop Android Application to demonstrate GUI by using different Layouts/widgets |
| 4 | Design and develop Android Application to demonstrate views in Android |
| 5 | Design and develop Android Application to demonstrate Intents(Implicit/ Explicit) |
| 6 | Design and develop Android Application to demonstrate Broadcast Receivers/Services |
| 7 | Design and develop Android Application to demonstrate Saving Files in External/Internal Storage |
| 8 | Design and develop Android Application to demonstrate Content Providers |
| 9 | Design and develop Android Application to demonstrate SQLite database (Dictionary, Quiz, etc.) |
| 10 | Design and develop Android Application to demonstrate firebase operations (data push, retrieval, delete, update etc.) |
| 11 | Design and develop Android Application to demonstrate MySQL database |
| 12 | Design and develop Android Application to demonstrate use of Telephony (Call/SMS) |
| 13 | Design and develop Android Application to demonstrate use of Bluetooth/wi-fi |
| 14 | Design and develop Android Application to demonstrate use of google map API |
| 15 | Design and develop Android Application to play audio/video files |
| 16 | Design and develop Android Application to demonstrate sensors (Accelerometer/Campass) |

Semester-VII

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|---|
| Course code: DSC23PCL401 Course name: Generative Adversarial Networks Course category: PCC |
| Credits: 3 Teaching scheme: L-3 Hrs/week Evaluation scheme: CA-40, MSE-20, ESE-40 |
| Duration of Theory Exam: 2Hrs |
| Pre-requisites: Basic understanding of machine learning methods |
| Course Objectives: |
| 1. To provide the basic understanding of the fundamental concept of GAN and CNN. |
| 2. To provide understanding of architecture of GAN and its integration with CNN |
| 3. To provide understanding of the application of GAN and CNN. |
| Course Outcomes: At the end of the course, the students will be able to - |
| CO1: Demonstrate proficiency in Fundamental concepts of GAN And CNN. |
| CO2: Analyze GAN and CNN Architecture and variants. |
| CO3: Apply GAN and CNN to real world problems. |
| CO4: Understand ethical Considerations and Responsible Use of GAN and CNN |

Contents –

| Unit | Contents | Teaching hours |
|------|--|----------------|
| 1 | Introduction to Generative Adversarial Networks - Overview of Generative Models, Introduction to GANs, Basic architecture of GANs, Training GANs, Challenges and common issues in GAN training. | 09 |
| 2 | Convolutional Neural Networks (CNN) Fundamentals - Basics of Convolutional Neural Networks, CNN architecture and components, Convolutional layers, pooling, and fully connected layers, Training CNNs for image classification tasks, Transfer learning with pre-trained CNNs | 09 |
| 3 | GAN Architectures and Variants - Deep Convolutional GAN, Conditional GANs, Info GAN (Information Maximizing GAN), Style GAN and StyleGAN2, Wasserstein GAN (WGAN) and WGAN-GP, Cycle GAN and Pix2Pix | 09 |
| 4 | Application of GANs and CNNs - Image-to-Image Translation, Super-Resolution, Face Aging and DE aging Image Synthesis and Style Transfer, Deep fake Generation, GANs in Healthcare and Biology | 09 |
| 5 | Advanced Topics and Research Directions -Progressive GANs, Self-Supervised Learning with GANs, Adversarial Auto encoders ,GANs for Anomaly Detection, Ethical Considerations in GANs, Future Trends and Emerging Research Areas. | 09 |

Text Books:

1 Devid Foster, "Generative Deep Learning", 1st edition O'Reilly (12 July 2019) , ISBN-10 : 1492041947

2. Jakub Langr and Daniel Kodex , “GANs in Action”, 1st edition, Manning, ISBN-13 ,978-1638354239

Reference Books:

1. Rafael Valley ”Hands-On Generative Adversarial Networks with Keras”, Packt Publishing Limited (3 May 2019), ISBN-10 : 1789538203, ISBN-13 : 978-1789538205
2. Ian Goodfellow, Yoshua Bengio, and Aaron Courville “Deep Learning”, Lakshmi Narain Agarwal (31 December 2024), IBISBIL

Online Resources: 1. NPTEL / SWAYAM lectures.

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Semester-VII

| | | |
|--|--------------------------------------|---|
| Course code: ITY23PCL402 | Course name: Cloud Computing | Course category: PCC |
| Credits: 2 | Teaching scheme: L-2 Hrs/Week | Evaluation scheme: CA-40, MSE-20, ESE-40 |
| Theory Exam Duration: 2 Hrs | | |
| Pre-requisites: Computer Networks | | |
| Course Objectives: | | |
| 1. To give students an insight into the basics of cloud computing along with virtualization. | | |
| 2. To provide the students basic understanding about cloud and virtualization along with how one can migrate over it | | |
| Course Outcomes: At the end of the course, the students will be able to - | | |
| CO1: Understand the concepts of Cloud Computing | | |
| CO2: Classify the different services in Cloud service models | | |
| CO3: Identify various virtualization techniques | | |
| CO4: Demonstrate the virtualization process using a simulator. | | |

Contents –

| Unit | Content | Teaching hours |
|------|--|----------------|
| 1 | Introduction - Cloud concept The Emergence of Cloud Computing, Cloud deployment Models, Characteristics of Cloud Computing, Challenges for the Cloud. | 6 |
| 2 | Cloud Service Models - Introduction to IaaS - IaaS definition, Examples: Amazon EC2 - Renting, EC2 Compute Unit, Platform and Storage, pricing. Introduction to PaaS -What is PaaS, Cloud Platform and Management -Computation, Storage,.Google App Engine , Microsoft Azure.Software as a Service (SaaS)- Introduction to SaaS, Web services, Salesforce.com platform. | 8 |
| 3 | Virtualization - Transaction Speed, Transaction Fees, Network Size, Complexity, Interoperability Problems, Lack of Standardization. Lack of Supportive Regulations Related to Blockchain Applications. | 8 |
| 4 | Cloud Simulator - Cloud Simulators CloudSim and GreenCloud Introduction to Simulator, understanding CloudSim simulator, CloudSim Architecture(User code, CloudSim, GridSim, SimJava) Understanding Working platform for CloudSim, Introduction to GreenCloud | 8 |

Text Books: 1. “Cloud Computing: Concepts, Technology & Architecture” By Ricardo Puttini, Thomas Erl, and Zaigham Mahmood, ISBN- 9789332535923, Pearson Education

Reference Books:

1. Gautam Shroff, “ Enterprise Cloud Computing Technology, Architecture, Applications”, Cambridge University press.

Semester-VII

| | | |
|---|---|--|
| Course code: ITY23PCP402 | Course name: Cloud Computing Lab | Course category: PCC |
| Credits: 1 | Teaching scheme: P-2 Hrs/Week | Evaluation scheme: TW-30, PR-20 |
| Pre-requisites: Computer Networks | | |
| Lab Objectives: | | |
| 1. To study the emergence and evolution of cloud computing | | |
| 2. To understand and explore different cloud service models | | |
| 3. To study and demonstrate virtualization techniques using various virtualization tools | | |
| Lab Outcomes: At the end of the course, the students will be able to - | | |
| LO1: Use Google Cloud services for printing and collaborative tasks effectively. | | |
| LO2: Apply and analyze virtualization techniques using different tools and platforms. | | |
| LO3: Access and utilize AWS cloud services for basic computing and storage requirements. | | |
| LO4: Identify and differentiate between various cloud services and deployment models | | |

List of Experiments

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|---|
| 1. To study Emergence of cloud computing |
| 2. To study different cloud services |
| 3. Demonstration of Google cloud Print |
| 4. Collaborating on Google Calendars, Google docs, sheets and Presentations |
| 5. Creating a warehouse application in salesforce.com |
| 6. Demonstration of Virtualization techniques using different tools |
| 7. Demonstration of AWS service using Amazon |
| 8. Virtualization using a Cloud Simulator |

Semester-VII

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|---|
| Course code: ITY23PCL403 Course name: Advanced Database Management System Course category: PCC |
| Credits: 2 Teaching scheme: L-2 Hrs/Week Evaluation scheme: CA-40, MSE-20, ESE-40 |
| Duration of Theory Exam: 2 Hrs |
| Pre-requisites: SQL and Query Processing, Data Structures and Algorithms |
| Course Objectives: |
| 1. Understand database storage structures and access techniques. |
| 2. Describe the design of Distributed Databases |
| 3. Know how to design a Database and XML |
| Course Outcomes: At the end of the course, the students will be able to - |
| CO1: Understand the concept of Data storage and querying. |
| CO2: Use XML and understand unstructured data. |
| CO3: Understand the basics of query processing, object-oriented, distributed databases. |
| CO4: Analyse and use emerging technologies such as Big Data, NoSQL. |

Contents –

| Unit | Content | Teaching hours |
|------|--|----------------|
| 1 | Data Storage and Querying - RAID – File Organization – Organization of Records in Files – Indexing and Hashing: Basic concept, Ordered Indices, B+ tree Index Files: Structure of a B+- Tree (structure only, algorithms not needed) - B tree index files – Static Hashing – Dynamic Hashing – Query Processing: Overview - Selection Operation. | 6 |
| 2 | Object Based Databases - Object Based Databases overview, Complex data types, Structured types and inheritance in SQL, Table inheritance, Array and multiset types in SQL, Object identity (OI) and reference types in SQL, Object-Oriented vs Object-Relational Databases | 6 |
| 3 | XML - Introduction, structure of XML data, XML document schema, Querying and Transformation, Application Program Interfaces to XML, Storage of XML Data, XML Applications | 6 |
| 4 | Parallel and Distributed Databases - Architectures for parallel databases; Parallel query evaluation; Parallelizing individual operations, Introduction to distributed databases; Distributed DBMS architectures; Storing data in a Distributed DBMS, Distributed Query processing; Updating distributed data; Distributed transactions | 6 |
| 5 | Advanced Database Techniques - Structured versus Unstructured Data, NoSQL database concepts : Types of NoSQL databases, NoSQL data modelling, Benefits of NoSQL, Comparison between SQL and NoSQL database system, NoSQL using MongoDB : Introduction to MongoDB Shell, Running the MongoDB shell, MongoDB client, Basic operations with MongoDB shell, Basic Data Types, Arrays, | 6 |

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| | Embedded Documents, Querying with MongoDB : find() function, specifying which keys to return, query criteria OR queries | |
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Text Books: 1. Abraham Silberschatz, Henry F. Korth, and S. Sudarshan, “Database System Concepts”, McGraw Hill Education, 6th Edition, 2011.

2. Ramez Elmasri and Hammant B. Navathe, “Fundamental Database Systems”, Pearson Education, 7th Edition, 2015.

Reference Books:

1. Carlos Coronel, Steven Morris “Database systems: Design Implementation and Management”, Cengage Learning Press, 11th Edition, 2014.
2. J. Murach, “Murach’s MySQL”, Shroff Publication, 2nd Edition, 2016.

E Resources: 1. UdeMy – “Mastering Database Management Systems From Basics to Advance”

2. GeeksforGeeks DBMS Tutorial

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Semester-VII

| | | |
|---|--|---|
| Course code: ITY23PCL404 | Course name: Advanced Web Programming | Course category: PCC |
| Credits: 2 | Teaching scheme: L-2 Hrs/Week | Evaluation scheme: CA-40, MSE-20, ESE-40 |
| Theory Exam Duration: 2 Hrs/Week | | |
| Pre-requisites: Basic knowledge of HTML5, JAVAScript, CSS | | |
| Course Objectives: | | |
| 1. To deepen understanding of the Java Servlet and JavaServer Pages (JSP) technologies | | |
| 2. To explore advanced web application concepts like security, concurrency, and scalability | | |
| 3. To introduce popular Java web frameworks for efficient development | | |
| 4. To build real-world web applications using best practices | | |
| Course Outcomes: At the end of the course, the students will be able to - | | |
| CO1: Demonstrate an in-depth understanding of the Java Servlet and JavaServer Pages (JSP) technologies | | |
| CO2: Explore advanced web application concepts like security, concurrency, and scalability | | |
| CO3: Identify and use popular Java web frameworks for efficient development | | |
| CO4: Build real-world web applications using best practices | | |

Contents –

| Unit | Content | Teaching hours |
|------|---|----------------|
| 1 | Java Enterprise Edition - Introduction, Overview of J2EE, J2EE Architectures JEE Services, HTTP protocol: Request and Response, Web Containers, Web Server., Introduction to Ajax, XML HTTP Request & Response, Introduction to RMI, RMI Architecture | 7 |
| 2 | Servlet Programming & Java Server Pages(JSP) - Basics of Servlet, Introduction to JSP: Life cycle of JSP, JSP API , Architecture. Scripting elements: scriptlet tag, expression tag, declaration tag ,Implicit Objects: out, request, response, config, application, session, pageContext, page, exception, Directive Elements: page directive, include directive , taglib directive, Exception Handling, Action Elements: jsp:forward, jsp:include, Bean class, jsp:useBean, jsp:setProperty & jsp:getProperty, Displaying applet in JSP, Custom tags: Custom Tag : What and Why? Custom Tag API? Custom Tag Example, Attributes, Iteration, Custom URI | 8 |
| 3 | Hibernet - Introduction to Hibernate: Overview of ORM and its importance Introduction to Hibernate framework Hibernate architecture and components 2. Setting Up Hibernate: Downloading and configuring Hibernate Configuring Hibernate properties Integrating Hibernate with Java applications 3. Hibernate Mapping: Entity mapping and Hibernate annotations Hibernate XML mapping files Composite keys and associations Inheritance mapping strategies 4. Hibernate Query Language (HQL): Basics of HQL and its syntax Retrieving and updating entities using HQL Named queries and native SQL queries Query caching and performance optimization | 8 |
| 4 | Introduction to spring - Introduction to Spring :Overview of Spring, Spring Architecture and Container, dependency injection, Spring Web MVC Framework. | 7 |

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| Text Books: 1. Subrahmanyam Allamaraju, Samir Tyagi, Karl Avedal, John Griffin, “Professional Java Server Programming”, Wrox Publication. |
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| 2. James Holmes, “The Complete Reference Struts”, TataMcGraw Hill. |
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| Reference Books: |
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| <ol style="list-style-type: none">1. Java Server Programming (Java EE 5) Black Book by Wiley Publication.2. Sharanam Shah, Vaishali Shah, “Java EE 6 for Beginners”, Shroff Publishers & Distributors Pvt. Ltd. |
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Semester-VII

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|---|---------------------------------------|--|
| Course code: ITY23PCP403 Course name: Advanced Database Management System Lab | | |
| Course category: PCC | | |
| Credits: 1 | Teaching scheme: P- 2 Hrs/Week | Evaluation scheme: TW–30, PR–20 |
| Pre-requisites: Basic DBMS Concepts, SQL Fundamentals | | |
| Lab Objectives: | | |
| 1. To understand methods of connecting to and accessing databases. | | |
| 2. To perform basic database operations using client tools or applications. | | |
| 3. To study database connectivity and session handling. | | |
| Lab Outcomes: At the end of the course, the students will be able to - | | |
| LO1: Connect to and access databases successfully. | | |
| LO2: Execute basic queries on a database. | | |
| LO3: Understand relational data management. | | |
| LO4: Understand advanced SQL type handling. | | |
| LO5: Understand XML processing mechanisms. | | |

List of Experiments

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|---|
| 1. Accessing the database |
| 2. Basics of SQL-DDL and DML |
| 3. To create arrays and multiset types in SQL |
| 4. Design XML Schema and XML instance document |
| 5. Study of Application Program Interfaces to XML |
| 6. To perform database activity using Indexing |
| 7. To study hashing techniques |
| 8. Querying with MongoDB : find() function, specifying which keys to return |
| 9. To study parallel and distributed databases. |
| 10. Perform basic operations with MongoDB shell |

Semester-VII

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|---|--------------------------------------|--|--|
| Course code: ITY23PCP404 | | Course name: Advanced Web Programming Lab | |
| Course category: PCC | | | |
| Credits: 1 | Teaching scheme: P-2 Hrs/Week | Evaluation scheme: TW-30, PR-20 | |
| Pre-requisites: core JAVA, OOP principles, web fundamentals | | | |
| Lab Objectives: | | | |
| 1. To deepen understanding of the Java Servlet and JavaServer Pages (JSP) technologies | | | |
| 2. To explore advanced web application concepts like security, concurrency, and scalability | | | |
| 3. To introduce popular Java web frameworks for efficient development | | | |
| 4. To build real-world web applications using best practices | | | |

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| Lab Outcomes: At the end of the course, the students will be able to - |
| LO1: To deepen understanding of the Java Servlet and JavaServer Pages (JSP) technologies |
| LO2: To explore advanced web application concepts like security, concurrency, and scalability |
| LO3: To introduce popular Java web frameworks for efficient development |
| LO4: To build real-world web applications using best practices |

List of Experiments

| |
|--|
| <ol style="list-style-type: none"> 1. Develop simple applications using AJAX and JSON. 2. Develop application using for Servlet life cycle 3. Develop a Servlet program to print HTTP header information. 4. Develop application using JSP 5. Develop application using JSP Elements: Directives, Scripting, Action tags 6. Develop application using JSP Directives, Scripting, Action tags, 7. Develop application using JSP object scope page, request, session 8. Develop application program using custom tags 9. Develop application stateless JavaBeans 10. Develop application stateful JavaBeans 11. Develop application entity JavaBeans 12. Develop a hibernate application to store the feedback of website visitors in database 13. Develop a simple Hibernate application using any Database. 14. Develop Simple MVC Spring application. |
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Semester-VII

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|---|--|---|
| Course code: ITY23RML401 | Course name: Research Methodology | Course category: RM |
| Credits: 4 | Teaching scheme: L- 4 Hrs/Week | Evaluation scheme: CA-40, MSE-20, ESE-40 |
| Theory Exam Duration: 2 Hrs | | |
| Pre-requisites: Knowledge of Mathematics and Statistics, Analytical and Logical Thinking | | |
| Course Objectives: | | |
| 1. To explain the nature and role of research in engineering practice | | |
| 2. To formulate research problems and objectives from engineering contexts | | |
| 3. To design appropriate research and experimental strategies | | |
| 4. To interpret engineering data and justify conclusions logically | | |
| 5. To apply ethical principles and IPR concepts in research work | | |
| 6. To prepare structured technical reports and research presentations | | |
| Course Outcomes: At the end of the course, the students will be able to - | | |
| CO1: Apply fundamental research concepts to engineering problems | | |
| CO2: Analyze real-world problems to frame researchable questions | | |
| CO3: Develop logically sound research designs | | |
| CO4: Analyze and interpret data to support engineering decisions | | |
| CO5: Evaluate ethical, legal, and societal implications of research | | |
| CO6: Create clear and structured research documents and presentations | | |

Contents –

| Unit | Content | Teaching hours |
|------|---|----------------|
| 1 | Foundations of Research in Engineering - Meaning and objectives of research; Engineering research vs. scientific research; Types of research: exploratory, descriptive, analytical, experimental, design-oriented; Basic research, applied research, translational research; Role of research in innovation, patents, and societal impact; Interdisciplinary and multidisciplinary research. | 10 |
| 2 | Problem Identification and research design - Identifying real-world engineering problems; Research gaps: literature-driven vs. practice-driven; Formulating research questions, objectives, and hypotheses; Variables, assumptions, and constraints; Research design types: experimental, quasi- experimental, observational, design-based; Validity and reliability (conceptual level). | 10 |
| 3 | Data, Measurement and Experimental Planning - Types of data: qualitative and quantitative; Scales of measurement; Sampling concepts and sample size logic; Design of experiments (introductory, non-mathematical); Error, uncertainty, and bias in engineering data; Ethical data collection practices. | 10 |

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|---|--|----|
| 4 | Data analysis and interpretation - Descriptive statistics for engineers; Conceptual understanding of inferential statistics; Trend analysis and correlation; Model validation and interpretation of results; Logical reasoning from data to conclusions; Common pitfalls in analysis and interpretation | 10 |
| 5 | Research ethics, IPR and academic integrity - Ethics in engineering research; Plagiarism, fabrication, falsification; Authorship and publication ethics; Intellectual Property Rights: patents, copyrights, trade secrets; Introduction to standards, codes, and compliance; Responsible research and innovation. | 10 |
| 6 | Technical writing and research communication - Structure of technical papers and theses; Writing research objectives, methodology, and conclusions; Use of figures, tables, and citations; Referencing styles and literature management; Peer review process and responding to reviewers; Oral presentation of research | 10 |

Text Books:

1. Booth, W.C., Colomb, G.G., & Williams, J.M. (2016), The Craft of Research, 4th Edition, University of Chicago Press

2. Creswell, J.W. (2014), Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 4th Edition, SAGE Publications

3. Kothari, C.R. (2019), Research Methodology: Methods and Techniques, 4th Edition, New Age International Publishers

4. Deb, D., Dey, R., & Balas, V.E. (2018), Engineering Research Methodology: A Practical Insight, Springer.

5. David Thiel (2014), Research Methods for Engineers, Cambridge University Press

6. P. Pandey & S.C. Pandey (2015), Research

Reference Books:

1. Ranjit Kumar (2019), Research Methodology: A Step-by-Step Guide for Beginners, 4th Edition, SAGE Publications

2. Uwe Flick (2018), Introducing Research Methodology: A Beginner's Guide, 2nd Edition, SAGE Publications

3. Saunders, M., Lewis, P., & Thornhill, A. (2019), Research Methods for Business Students, 7th Edition, Pearson

4. Dipak Bhattacharya (2018), Research Methodology: Principles and Practices, 5th Edition, Excel Books

5. Herman Tang (2023), Engineering Research: Design, Methods, and Publication, Wiley.

6. R.A. Fisher (1935), The Design of Experiments, Oliver & Boyd Ltd.

Semester-VII

| | | |
|---|---------------------------------------|--|
| Course code: ITY23RPJ401 | Course name: Research Project | Course category: RP |
| Credits: 4 | Teaching scheme: P- 8 Hrs/Week | Evaluation scheme: TW-60, PR-40 |
| Pre-requisites: Knowledge of Mathematics and Statistics, Analytical and Logical Thinking | | |
| Lab Objectives: | | |
| 1. To identify and analyze a real-world engineering problem | | |
| 2. To design and develop a systematic solution or prototype | | |
| 3. To implement and validate the proposed methodology through experimentation, simulation, or real-time data analysis. | | |
| 4. To evaluate the performance of the proposed system using suitable metrics and compare it with baseline or existing approaches. | | |
| Lab Outcomes: At the end of the course, the students will be able to - | | |
| LO1: Apply engineering knowledge and problem-solving skills to develop an effective and feasible technical solution. | | |
| LO2: Demonstrate research aptitude, including literature review, methodology formulation, experimentation, and result interpretation.. | | |
| LO3: Hands-on experience with modern engineering tools and technologies relevant to the chosen domain | | |
| LO4: Enhance professional skills, including technical documentation, teamwork, presentation, and ethical responsibility. | | |

PROJECT GUIDELINES

1. Project Group size should be of maximum 4 students.
2. The project is to be taken up at the start of semester I and the project must be completed by the end of semester II.
3. While submitting project proposal care is to be taken that the project will be completed within the available time of two terms.
4. Project title should be precise and clear. Selection and approval of topic: Topic should be related to real life or commercial application in the field of Information Technology.

OR

Investigation of the latest development in a specific field of Information Technology.

OR

Commercial and Interdisciplinary projects should be encouraged. The examination will be conducted independently in respective departments.

5. The group should maintain a logbook of activities. It should have entries related to the work done, problems faced, solution evolved etc., duly signed by guide. This data should be used for finding the total man hours and estimating the cost of the project.

6. The group is expected to complete details Literature Survey, system/problem definition, analysis, design, etc. in (B.E. first Term) seventh term, as a part of term work in the form of a joint report.

Project report must be submitted in the prescribed format only. No variation in the format will be accepted.

7. The guides should regularly monitor the progress of the project work.

8. Assessment of the project for award of term work marks shall be done by the guide and a departmental committee as per the guidelines given in the following table.

9. The suggestive format of the report is as follows:

(Only one report should be submitted per group as a part of term work submission.)

Title of the Project:

Names & Roll Numbers of the students:

Name of the guide:

Chapter 1: Introduction

Chapter 2: Literature Survey

Chapter 3: System Development

A) Assessment of project –I Term Work B. Tech. First Term

Name of the Project: _____

Name of the Guide: _____

| Sr. No. | Exam Seat No. | Name of the Student | Assessment by Guide (70%) | | | | | Assessment by Departmental Committee (30%) | | | Grand Total |
|---------|---------------|---------------------|---------------------------|-----------------|---------------|------------|-------|--|--------------|-------|-------------|
| | | | Literature Survey | Topic Selection | Documentation | Attendance | Total | Evaluation | Presentation | Total | |
| | | Marks | 05 | 2.5 | 7.5 | 2.5 | 17.5 | 2.5 | 5 | 7.5 | 25 |
| | | | | | | | | | | | |
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Semester-VIII

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|---|--------------------------------------|---|
| Course code: ITY23PEL452 | Course name: IoT Cloud | Course category: PEC |
| Credits: 4 | Teaching scheme: L-4 Hrs/Week | Evaluation scheme: CA-40, MSE-20, ESE-40 |
| Theory Exam Duration: 2 Hrs | | |
| Pre-requisites: Basics of IoT architecture and protocols, Fundamentals of Cloud Computing, Introductory Data Analytics and Machine Learning, Digital logic circuits, Networking, wireless transmission | | |
| Course Objectives: | | |
| 1. To understand the fundamentals of IoT devices, networking, and communication protocols. | | |
| 2. To learn cloud-based architectures and platforms for scalable IoT analytics. | | |
| 3. To apply data science and machine learning techniques to IoT data. | | |
| 4. To design efficient data storage, processing, and management strategies for IoT systems. | | |
| 5. To deploy, visualize, and optimize IoT analytics solutions using modern cloud platforms. | | |
| Course Outcomes: At the end of the course, the students will be able to - | | |
| CO1: Explain IoT networking concepts, protocols, and data messaging mechanisms. | | |
| CO2: Design cloud-based IoT analytics architectures using elastic and scalable services. | | |
| CO3: Apply machine learning and data science techniques to analyze IoT data. | | |
| CO4: Organize and manage large-scale IoT datasets using data lakes and retention strategies. | | |
| CO5: Deploy and visualize IoT analytics solutions using platforms such as AWS, Azure, and ThingSpeak | | |

Contents –

| Unit | Content | Teaching hours |
|------|--|----------------|
| 1 | IoT Networking Foundations: IoT devices, Networking basics, IoT networking connectivity protocols, IoT networking data messaging protocols, Analyzing data to infer protocol and device characteristics | 9 |
| 2 | IoT Analytics for the Cloud - Introduction to elastic analytics, Decouple key components, Cloud security and analytics, Designing data processing for analytics, Applying big data technology to storage. | 8 |
| 3 | Cloud-Based IoT Architecture and Data Processing: Cloud-based IoT reference architectures-IoT data ingestion and integration mechanisms-Stream processing vs batch processing of IoT data-Designing scalable and fault-tolerant IoT data pipelines- Cloud security challenges in IoT data processing- -Interoperability and integration of heterogeneous IoT devices. | 9 |
| 4 | Data Science for IoT Analytics - Data Science for IoT Analytics: Introduction to Machine Learning, Feature engineering with IoT data, Validation methods, Understanding the bias-variance tradeoff, Use cases for deep learning with IoT data. | 9 |
| 5 | Strategies to Organize Data for Analytics - Linked Analytical Datasets, Managing data lakes, data retention strategy- Data modeling approaches for | 5 |

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|---|--|----|
| | analytical workloads- Managing data lakes for large-scale IoT data- Data governance, privacy, and compliance considerations | |
| 6 | Deployment, Visualization, and Future Trends in IoT Cloud Analytics: Deployment of IoT analytics models on the cloud- Real-time dashboards and data visualization tools- Monitoring, logging, and performance optimization- Edge-Cloud integration for IoT analytics- Emerging trends: AIoT, serverless IoT analytics, digital twins, and autonomous IoT systems- AWS IoT Analytics, AWS Lambda, and Amazon S3 for IoT data processing- Microsoft Azure IoT Hub, Azure Stream Analytics, Azure Data Lake- ThingSpeak for IoT data collection and visualization. | 10 |

Text Books: 1. Arshdeep Bahga and Vijay Madiseti, "Internet of Things – A Hands on Approach", Universities Press, 2015.

2. Kevin, Townsend, Carles, Cufi, Akiba and Robert Davidson, "Getting Started with Bluetooth Low Energy" O'Reilly.

2. Min Chen, Shiwen Mao, and Yunhao Liu, "Big Data: Related Technologies, Challenges and Future Prospects", Springer, 2014.

3. Rajkumar Buyya et al., "Cloud Computing: Principles and Paradigms", Wiley, 2011

Reference Books:

1. David Hanes et al., "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases",
2. Cisco Press, 2017.
3. Foster Provost & Tom Fawcett, "Data Science for Business", O'Reilly Media, 2013.
4. AWS Whitepapers, AWS IoT and Analytics Documentation.
5. Microsoft Documentation, Azure IoT Hub and Azure Stream Analytics.
6. MathWorks Documentation, ThingSpeak for IoT Analytics.

Semester-VIII

Course code: AIM23PEL451 **Course name:** Natural Language Processing **Course category:** PEC
Credits: 4 **Teaching scheme:** L-4 Hrs/Week **Evaluation scheme:** CA-40, MSE-20, ESE-40
Duration of Theory Exam: 2 Hrs.

Pre-requisites: 1. Data Structure and Algorithms 2. Foundations of Machine Learning 3. Python Programming

Course Objectives:

1. To introduce the fundamentals of Natural Language Processing.
2. To understand linguistic and statistical techniques for text processing.
3. To apply NLP methods to real-world applications.

Course Outcomes: At the end of the course, the students will be able to -

- CO1:** Understand the fundamentals and challenges of Natural Language Processing
CO2: Apply text preprocessing and linguistic analysis techniques
CO3: Analyze syntactic structures using parsing techniques
CO4: Implement semantic analysis and discourse processing methods
CO5: Use statistical and machine learning approaches for NLP tasks
CO6: Design and evaluate NLP applications for real-world problems

Contents –

| Unit | Content | Teaching hours |
|------|---|----------------|
| 1 | Introduction to Natural Language Processing: What is Natural Language Processing, Applications of NLP, Levels of Language Analysis, Challenges in NLP, NLP Pipeline, Overview of NLP tools and libraries. | 9 |
| 2 | Text Processing and Morphological Analysis: Text normalization, Tokenization, Stop word removal, Stemming and Lemmatization, Morphological analysis, Regular expressions for text processing. | 9 |
| 3 | Syntax and Parsing: Part-of-Speech (POS) tagging, Rule-based and stochastic POS tagging, Context Free Grammar (CFG), Constituency parsing, Dependency parsing, Parsing algorithms. | 9 |
| 4 | Semantic Analysis: Meaning representation, Lexical semantics, Word sense disambiguation, Semantic role labeling, Named Entity Recognition (NER), Ontologies and WordNet | 9 |
| 5 | Statistical and Machine Learning Approaches: N-gram language models, Vector space model, Feature extraction for NLP, Supervised vs unsupervised learning in NLP, Text classification techniques, Introduction to word embedding's. | 9 |
| 6 | Advanced NLP and Applications: Information retrieval, Information extraction, Machine translation, Sentiment analysis, Question answering systems, Overview of deep learning for NLP. | 9 |

Text Books: 1. Dan Jurafsky and James H. Martin, “Speech and Language Processing”, 3rd edition draft, 2025
2. Steven Bird, Ewan Klein, and Edward Loper, Natural Language Processing with Python, O’Reilly.

Reference Books:

1. Christopher D. Manning and Hinrich Schütze, “Foundations of Statistical Natural Language Processing”, MIT Press, 1999.
2. James Allen, “Natural Language Understanding”, Benjamin/Cummings, 2nd edition, 1995.

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Semester-VIII

Course Code: AIM23PEL452 **Course name:** Cyber Security and Digital Forensics **Course category:** PEC

Credits: 4 **Teaching scheme:** L-4 Hrs/Week **Evaluation scheme:** CA-40, MSE-20, ESE-40

Duration of Theory Exam: 2 Hrs

Pre-requisites: Basic Knowledge of Cryptography and Networks security

Course Objectives:

1. To introduce the fundamental concepts of computer and network security,
2. To provide a strong foundation in symmetric and public key cryptographic algorithms
3. To understand and apply authentication mechanisms using hash functions and digital signatures
4. To acquaint with the digital forensic investigation process
5. To learn the process of data acquisition in a digital crime scene
6. To understand the various file system analysis and understand various pieces of evidence on the internet.

Course Outcomes: At the end of the course, the students will be able to -

CO1: Understand the fundamentals of computer and networks security, security architecture

CO2: Apply the different cryptographic operations of symmetric cryptographic algorithms and public key cryptography

CO3: Apply the various Authentication schemes to simulate different applications.

CO4: Understand the digital forensic investigation process.

CO5: Understand the process of data acquisition in a digital crime scene

CO6: Analyze the evidence from the file system

Contents –

| Unit | Content | Teaching hours |
|------|---|----------------|
| 1 | INTRODUCTION TO SECURITY & SYMMETRIC ENCRYPTION Conventional encryption, Security attacks, Security, Model for network security, classical encryption techniques, DES, Triple DES, AES, block cipher modes, stream ciphers, key distribution, random number generation. | 9 |
| 2 | PUBLIC KEY CRYPTOGRAPHY: Introduction to number theory, Public - Key cryptography, principles of public – key cryptosystems, RSA algorithm, key management, distribution of public keys, public key – distribution of secret keys, elliptic curve cryptography. | 9 |
| 3 | AUTHENTICATION USING HASH FUNCTIONS: Message authentication and hash functions, hash and MAC algorithms, digital signatures, authentication protocols, Kerberos, x- 509 directory. APPLICATIONS OF SECURITY: intrusion detection, malicious software, firewalls | 9 |
| 4 | Introduction To Computer Forensics: Introduction to Traditional Computer Crime, Traditional problems associated with Computer Crime. Incident and Incident Response(IR) methodology – Forensic duplication and investigation. Preparation for IR. | 9 |
| 5 | Data Acquisition: Understanding storage formats and digital evidence, determining the best acquisition method, acquisition tools, validating data acquisitions, performing | 9 |

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|---|--|---|
| | RAID data acquisitions, remote network acquisition tools and other forensics acquisitions Tools | |
| 6 | File System Analysis: Windows System Forensics, Linux System Forensics, Case study on Cyber Forensics . Securing SDN: Network Forensics Investigation and Digital Evidence: Email analysis, Network analysis , Study of Forensic Tools (Wireshark, nmap, etc.) | 9 |

Text Books:

1. B.A. Forouzan and Debdeep Mukhopadhyay, “ Cryptography and Network Security;, Tata McGraw Hill, 2nd Edition.
2. William Stalling, “Cryptography and Network Security, Principles & Practices, Pearson Education Publication Fifth Edition.
3. John R. Vacca, "Computer Forensics: Computer Crime Scene Investigation", 2nd Edition, Charles, River Media, 2005 ISBN: 1584503890 , 9781584503897.

Reference Books:

1. C K Shyamala, N Harini and Dr. T R Padmanabhan: Cryptography and Network Security, Wiley India Pvt. Ltd
2. Nina Godbole, Sunit Belapure, “Cyber Security- Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, Wiley India Pvt.Ltd

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Semester-VIII

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| Course code: ITY23PEL455 Course name: Cyber Security in IoT Course category: PEC |
| Credits: 4 Teaching scheme: L-4 Hrs/Week Evaluation scheme: CA-40, MSE-20, ESE-40 |
| Duration of Theory Exam: 2 Hrs |
| Pre-requisites: Basic knowledge of Computer Networks, Fundamentals of Internet of Things (IoT), Introduction to Cloud Computing |
| Course Objectives: |
| 1. To learn about the security issues in IoT and cloud computing. |
| 2. To learn about the cryptography solutions and issues in IoT. |
| 3. To learn about the security measures taken in IoT and Cloud systems to improve security. |
| Course Outcomes: At the end of the course, the students will be able to - |
| CO1: Understand the fundamental security issues in Internet of things. |
| CO2: Demonstrate different Frameworks and Hardware Architecture of IoT Device. |
| CO3: Analyze different IoT Protocols and Layer Functioning. |
| CO4: Protect and secure the network connecting IoT devices to back-end systems on the internet. |
| CO5: Demonstrate different authentication mechanism such as digital certificates, biometrics, etc. |

Contents –

| Unit | Content | Teaching hours |
|------|---|----------------|
| 1 | FUNDAMENTALS OF IoT ECOSYSTEM: IoT security issues, how to design an IoT system, Hardware, software and network security related to IoT systems - Basics of cryptographic solutions to IoT systems. | 5 |
| 2 | OVERVIEW OF CLOUD COMPUTING AND ITS SERVICES Cloud Computing Fundamental: Cloud computing definition, private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS, block chain as a service with cyber security | 8 |
| 3 | CHALLENGES IN CLOUD COMPUTING: Benefits and challenges of cloud computing - Public vs. Private clouds, Role of virtualization in enabling the cloud | 9 |
| 4 | SECURITY CONCEPTS IN CONTEXT TO IoT DEVICES 9 Hrs. Security Concepts: Confidentiality, privacy, integrity, authentication, non-repudiation, Virtualization | 10 |

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| 5 | IoT SECURITY THREATS AND COUNTERMEASURES: System-Specific Attacks: Guest hopping, attacks on the VM (delete the VM, attack on the control of the VM, code or file injection into the virtualized file structure), VM migration attack, hyper jacking. | 10 |
| 6 | ADVANCED CYBERSECURITY IN INTERNET OF THINGS SYSTEMS: Advanced security threats and attack surfaces in large-scale IoT environments; zero-trust security architecture for IoT systems; secure device provisioning, secure boot, firmware integrity- hardware root of trust in IoT devices; cybersecurity architectures for Industrial IoT (IIoT) and Smart City applications; blockchain-based identity management and access control for IoT; lightweight and post-quantum cryptographic techniques for resource-constrained IoT devices; machine learning and deep learning-based intrusion detection and anomaly detection in IoT networks; trust and reputation management models for IoT device collaboration; privacy-preserving data security techniques for IoT, including differential privacy and secure data aggregation; IoT security standards, compliance frameworks | 10 |

Text Books: 1. David Etter, “ IoT Security: Practical guide book “ Create Space, 1st Edition, 2016.
2. Drew Van Duren, Brian Russell, “Practical Internet of Things Security”, Packt, 1st Edition, 2016

Reference Books:

1. Internet of Things Security: Attacks, Tools, Techniques and Challenges – Mishra et al., Elsevier (2025).
2. IoT Security: Fundamentals and Key Enabling Technologies – Islam et al., Elsevier (2025).
3. Cloud Security: Concepts, Applications and Practices – Murthy et al., Routledge (2025).
4. Cybersecurity of Industrial Internet of Things (IIoT) – Buja, CRC Press (2026).

Semester-VIII

Course code: AIM23PEL453 **Course name:** Intellectual Property Rights **Course Category:** PEC
Credits: 4 **Teaching scheme:** L-4Hrs/Week **Evaluation scheme:** CA-40, MSE-20, ESE-40
Duration of Theory Exam: 2 Hrs

Pre-requisites: Awareness of IPR, Patent act 1970

Course Objectives:

1. To explain the formulation of a Research Problem.
2. To explain the importance of ideas, concepts and creativity.
3. To transfer the knowledge about the IPR required for Engineer's
4. To describe how IPR creates National wealth.
5. To teach National and International IP System

Course Outcomes: At the end of the course, the students will be able to -

CO1: Formulate the research problem with appropriate objectives

CO2: Understand the right of ownership, scope of protection as well as the ways to create and to extract value from IP.

CO3: Identify different types of Intellectual Properties (IPs)

CO4: Discover how IPR are regarded as a source of national wealth and mark of an economic leadership in context of global market scenario

CO5: Analyze national & International IP system

Contents –

| Unit | Content | Teaching hours |
|------|--|----------------|
| 1 | Introduction to Research problem: Meaning of research problem, Sources of research problem, Criteria characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations, Effective literature studies approaches, analysis Plagiarism, Research ethics | 9 |
| 2 | Introduction to Intellectual Property: Introduction to the concepts Property and Intellectual Property, Nature and Importance of Intellectual Property Rights Understanding the types of Intellectual Property Rights:-Patents, Designs, Trademarks (Registered and unregistered trademarks), Copyright, Traditional Knowledge, Geographical Indications, Trade Secrets, Idea Patenting, (Case Studies) | 9 |
| 3 | Introduction to Trade Marks: Purpose and function of trademarks, Acquisition of trade mark rights, transfer of rights, Selecting and evaluating trademark, registration of trademarks, claims. Trade Secrets: Trade secret law, determination of trade secret status, liability for misappropriation of trade secrets, trade secret litigation. | 9 |
| 4 | Introduction to Copyrights Geographical Indication of Goods: Basic aspects and need for the registration, Fundamentals of copyright law, originality of material, right of reproduction, right to perform the work publicly, copyright ownership issues, notice of copyright. | 9 |

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| 5 | Introduction to Patent: New Developments in IPR, Process of Patenting and Development: technological research, innovation, patenting, development, International Scenario: WIPO, TRIPs, Indian Patent Office and its Administration | 9 |
| 6 | Intellectual Property Rights Act, 1970 and Amendments: Overview of the Indian Patents Act, 1970, Key Provisions of the Act, Amendments to the Patents Act, Patent Filing and Examination Process, Case Studies | 9 |

Text Books: 1. "Intellectual property right" by Deborah E Bouchoux
2. Intellectual property rights" by N.K Acharya

Reference Books:

1. Intellectual property rights by P. Radhakrishnan Wayne Goddard and Stuart Melville,
2. Research methodology: a step by step guide for beginners, Ranjit Kumar , 4th edn, SAGE Publications Pvt. Ltd

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Semester-VIII

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| Course code: AIM23PEL454 Course name: Robotics Process Automation Course category: PEC |
| Credits: 4 Teaching scheme: L-4 Hrs/Week Evaluation scheme: CA-40, MSE-20, ESE-40 |
| Duration of Theory Exam: 2 Hrs |
| Pre-requisites: Basic knowledge of software coding and programming logic |
| Course Objectives: |
| 1. To introduce the fundamental concepts, evolution, and applications of Robotic Process Automation (RPA). |
| 2. To provide hands-on knowledge of UiPath platform components, workflow design, and automation development. |
| 3. To develop skills in implementing UI automation, system automation, data handling, and application integration using RPA tools |
| 4. To enable students to design, deploy, and manage automation workflows using UiPath Orchestrator and other RPA tools. |
| 5. To familiarize learners with advanced automation techniques including recording, scraping, selectors, and workflow optimization. |
| Course Outcomes: At the end of the course, the students will be able to - |
| CO1: Explain the concepts, evolution, architecture, and applications of Robotic Process Automation and differentiate it from traditional automation techniques. |
| CO2: Demonstrate the ability to install, configure, and use UiPath platform components for designing automation workflows. |
| CO3: Develop automation solutions using UI automation activities, system activities, variables, arguments, and event-driven automation. |
| CO4: Implement application integration, recording techniques, scraping methods, selectors, and workflow activities for real-time automation tasks. |
| CO5: Deploy, monitor, and manage automation processes using UiPath Orchestrator and evaluate different RPA tools. |

Contents –

| Unit | Content | Teaching hours |
|------|--|----------------|
| 1 | Introduction to Robotics process automation: Emergence of Robotic Process Automation (RPA), Evolution of RPA, Future of RPA, Differentiating RPA from Automation, Defining Robotic Process Automation; its benefits, Types of Bots, | 9 |

| | | |
|---|--|----|
| | Application areas of RPA, How Robotic Process, Automation works, RPA development methodology and key considerations, List of Robotic Process Automation tool | |
| 2 | Overview of UI path: Introduction to UiPath platform and its components, Installation details of UiPath's Community, Edition, Types of Templates, User Interface, Domains in Activities, Workflow Files in Ui Path | 8 |
| 3 | Process components and activities: UI Automation Activities, System Activities, Variables, Arguments, Imports Panel, User Events | 9 |
| 4 | App Integration, Recording and Scraping: App Integration, Recording, Scraping, Selector, Workflow activities | 9 |
| 5 | Orchestrator community edition and RPA tool: UiPath Orchestrator Overview, Orchestrator activities, Introduction to Orchestrator CE, Orchestrator CE, Other RPA tools | 9 |
| 6 | Cognitive Automation and AI Integration: Introduction to Cognitive Automation, Natural Language Processing (NLP) for Bots, Machine Learning in RPA, Image and Text Recognition, Chatbots and Virtual Assistants, AI Model Integration in RPA Workflows, Ethics and Bias in AI-powered Automation. | 10 |

Text Books:

1. Robotic Process Automation Handbook: A Guide to Implementing RPA Systems by Tom Taulli
2. Introducing Robotic Process Automation to Your Organization by Robert Fantina, Andriy Storozhuk, and Kamal Goyal

Reference Books: 1. Robotics and Automation (Course Handbook) – MITE, covering fundamentals of robotics, automation systems, and industrial applications