|  |  |  |
| --- | --- | --- |
| **Version 07/19-11** |  | **Consolidated Academic Administration Plan for the Course**  ***INTEGRATED CIRCUITS (core) Sem. IV – Program \_EXTC 2024-25 –Even***  ***Semester***  ***Faculty – Dr Anand R Tripathi & Prof. SATENDRA MANE(Cluster Mentor)*** |
|  |  |  |

**The academic resources available in VIT –**

|  |  |  |  |
| --- | --- | --- | --- |
| **VMIS (ERP)** | **V-Refer and V-Live** | **VIT Library** | **VAC & MOOC**  **Courses** |
| Institute &  Department Vision and Mission | Former IA question papers  and solutions (prepared by faculty) | Former IA question  papers solutions - hardcopy | Value Added Courses (VAC) are conducted throughout the semester & in the semester break - Enrol for the VACs |
| Program Educational Objectives (PEO) | MU end semester examination question papers and solutions (prepared by  faculty) | MU end semester exam question paper & solutions - by faculty,  hardcopy |
| Program Specific Outcome (PSO) | Class notes and Digital Content for the subject (scanned / typed by faculty) | All text books, reference books, e -books mentioned in the  syllabus & AAP | Online courses from NPTEL, Coursera etc. are pursued throughout the semester - Register for  the course & get certified |
| Program Outcome (PO) | Comprehensive question bank, EQ, GQ, PPT, Class Test  papers | Technical journals and magazines for reference |
| Departmental Knowledge Map | Academic Administration Plan & Beyond Syllabus Activity report | VIT library has many resources e:g :- IEEE, Nimbus, xplore, EBSCO  etc. | Watch former lectures captured in LMS at VIT |

**Course Objectives (Write in detail – as per NBA guidelines)**

**1.a**

|  |  |  |
| --- | --- | --- |
| Cognitive | What do you want students to know? | Need and significance of Differential Amplifier. Working and  analysis of various types of discrete amplifier circuits. |
| Affective | What do you want students to think / care  about? | Use and application of op-amp in designing of various  electronic circuits and systems. |
| Behavioural | What do you want  students to be able to do? | Understand, analyse and designing of OP-AMP based circuits  for various application. |

**Advice to Students:**

Attend every class!!! Missing even one class can have a substantial effect on your ability to understand the course. Be prepared to think and concentrate, in the class and outside. I will try to make the class very interactive. Participate in the class discussions. Ask questions when you don’t understand something. Keep up with the class readings. Start assignments and homework early. Meet me in office hour to discuss ideas, solutions or to check if, what you understand is correct.

The v-Refer Link Example: <http://vidyalankarlive.com/vrefer/index.php/apps/files/?dir=/vRefer/FE/SEM%20I/202122/Engineering%20Me> chanics/GM&fileid=586945 /

Creation of microsite or team’s link

Example: - https://cs50.harvard.edu/college/2021/spring/)

**Collaboration Policy:**

We encourage discussion between students regarding the course material. However, no discussion of any sort is allowed with anyone on the assignment and homework for the class. If you find solution to some problems in a book or on the internet, you may use their idea for the solution; provided you acknowledge the source (name and page in the book or the website, if the idea is found on the internet). Even though you are allowed to use ideas from another source, you must write the solution in your own words. If you are unsure whether or not certain kinds of collaboration is possible, please ask the teacher.

|  |  |  |
| --- | --- | --- |
| **1.b** | **Course Outcome (CO) Statements and Module-Wise Mapping (follow NBA guideline)** | |
| CO No. | Statements | Related Module/s |
| CO1 | Describe the ideal and practical characteristics of various Integrated circuits. | All modules. |
| CO2 | Design circuits for various linear and Non-linear applications. | 1,2,34,5 |
| CO3 | Identify the appropriate Integrated circuit modules for designing Engineering application. | 1,2,3,4,5 |
| CO4 | Demonstrate the application of voltage regulator, Timer and PLL | 4,5,6 |

|  |  |
| --- | --- |
| **1.c** | **Mapping of COs with POs (mark S: Strong, M: Moderate, W: Weak, Dash ‘–’: not mapped) (List of POs is available in V-refer)** |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 |
|  | Knowle dge A | Anal ysis | Desi gn | Investig ation | Mod ern Tool  s | Soci ety | Environm ent &sustain  ability | Ethi cs T | Team work C | Communi cation | Proj ect Mgt | Life long learn  ing |
| C O  1 | M | W | M | - | - | - | - | - | - | - | - | - |
| C O 2 | S | W | W | - | M | - | - | - | - | - | - | - |
| C O  3 | S | - | W | - | M | - | - | - | - | - | - | - |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| C O  4 | S | W | M | - | M | - | - | - | - | - | - | - |

|  |  |
| --- | --- |
| **1.d** | **Mapping of COs with PSOs (mark S: Strong, M: Moderate, W: Weak, Dash ‘–’: not mapped)** |

|  |  |  |
| --- | --- | --- |
|  | PSO 1 | PSO 2 |
| CO 1 | S | M |
| CO 2 | M | W |
| CO 3 | M | W |
| CO 4 | M | M |

|  |  |
| --- | --- |
| **1.e** | **Teaching and Examination Scheme (As specified by the autonomous syllabus) for the Course** |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Verticals | BSC/ESC | Program  Courses | Multidisciplinary  Courses | Skill  Courses | HSSM | Experiential  Learning | Liberal  Learning |
| Tick suitable category |  | **√** |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Subject Code | Subject Name | **Teaching Scheme** | | | Credits Assigned | | | |
| Theory | Practical | Tutorial | Theory | TW/Practical | Tutorial | Total |
| ET06T | Integrated Circuits. | 2  Hrs/week | - | - | 2 | - |  | 2 |
| ET06P | Integrated Circuit Lab. | - | 2  Hrs/Batch/week. | - | - |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Subject Code | Subject Name |  |  | | **Examination Scheme** | | | | | |
| **Theory** | | | | **Total (Theory)** | **Practical** | | | **Total (Practical)** |
| ISA | MSE | ESE | | ISA | ESE | ORAL |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ET06T | Integrated  Circuits. | 15 | 20 | 40 | 75 | 25 | 25 |  | 50 |
| ET06P | Integrated  Circuit Lab. |  |  |  |  |  |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Subject Code | Subject Name | **MSE\*** | | |
| Q, No | Distribution | Relevant to Bloom Taxonomy |
| ET06T | Integrated Circuits. | 1 | Attempt any 2 questions out of 3. Each question of 5  Marks. | Remember, Analyse, Understand and Design. |
|  |  | 2 | Attempt any 1 question out of 2. Each question of 10  marks. | Remember, Analyse, Understand and Design. |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Subject Code | Subject Name | | **ESE#** | | | | | |
| Q, No | | Distribution | | Relevant to Bloom  Taxonomy | |
| ET06T | Integrated Circuits. | | 1 | | Attempt any 2 questions out of 3. Each question of 5  Marks. | | Remember, Analyse, Understand and Design. | |
|  |  | | 2 | | Attempt any 1 | | Remember, Analyse, | |
|  | | question out of 2. | | Understand and | |
|  | | Each question of 10 | | Design. | |
|  | | marks. | |  | |
|  | |  | | 3 | | Attempt any 1 | | Remember, |
|  | | question out of 2. | | Analyse, |
|  | | Each question of 10 | | Understand |
|  | | marks. | | and Design. |
|  | |  | | 4 | | Attempt any 1 | | Remember, |
|  | | question out of 2. | | Analyse, |
|  | | Each question of 10 | | Understand |
|  | | marks. | | and Design. |

**\* Recommended distribution: -** 30 Marks from Assignments, 40 marks based on assignments with slightly enhance difficulty /complex, 30 marks from thought provoking

**# Recommended distribution: -** 30 Marks from Assignments, 40 marks based on assignments/MSE with slightly enhance difficulty /complex, 30 marks from thought provoking

|  |  |
| --- | --- |
| **1.f** | **Faculty-Wise Distribution of all Lecture-Practical-Tutorial Hours for the Course** |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Divisions | Lecture (Hrs.) | Practical (Hrs.) | | | | Tutorial (Hrs.) | | | |
| Batch  1 | Batch 2 | Batch 3 | Batch 4 | Batch 1 | Batch 2 | Batch 3 | Batch 4 |
| **A** | SMA | SMA | SMA | ART |  |  |  |  |  |
| **B** | ART | ART | ART | ART |  |  |  |  |  |
| **C** |  |  |  |  |  |  |  |  |  |

|  |  |
| --- | --- |
| **1.g** | **Office Hours (Faculty will be available in office in this duration for solving students’ query)** |

|  |  |  |  |
| --- | --- | --- | --- |
| Division | Day | Time (at least 1 Hr. / Division) | Venue (Office Room No.) |
| A | MONDAY | 3.45 TO 4.45PM | M414 |
| B | MONDAY | 3.45 TO 4.45PM | M414 |
| C |  |  |  |

|  |  |
| --- | --- |
| **2.a** | **Syllabus: Module Wise Teaching Hours and % Weightage in autonomous syllabus Question Paper** |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Module No. | Module Title and Brief Details | Teaching Hrs. for each module | % Weightage in autonomous syllabus Question Papers | | | Performance Indicator Mapping |
| MSE1 | MSE2 | ESE |
| 1 | **Introduction to Operational Amplifier.**   * 1. Block diagram and working of Operational Amplifier. Various parameters of Operational Amplifier. Typical values for IC741.   2. Inverting, non-inverting amplifier using op-amp (Both open and close loop). Arithmetic circuits like Adder, Subtractor.   Numerical based on op-amp  circuits. | 4 | 15M |  | 5M |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Learning Outcome | * Understand the block diagram and the internal working principles of an operational amplifier. * Recognize the typical values of these parameters for widely used op-amp ICs, such as   the IC 741. • Design and analyze arithmetic circuits | | | | | |
| 2 | **Linear applications of Operational Amplifier.**  2.1 Need for Instrumentation amplifier analysis of 3 op-amp Instrumentation Amplifier. Basic  and | 7 | 10M |  | 5M |  |
|  | Practical Integrator and Differentiating circuits. Voltage to current and current to voltage converter circuits.  2.1 Filters using op-amp.  Analysis and designing of 1st Order Butterworth Filter using op-amp. Working and designing of 2nd order filter using op-amp (No derivation for  2nd order filter) |  |  |  |  |  |
| Learning Outcome | **Need and use of**   * Instrumentation Amplifier * Differentiator * Integrator * converters * filters | | | | | |
| 3 | **Non-Linear Applications of Operational Amplifier.**  3.1 Comparator using op-amp, Working, analysis, designing and application of Schmitt-Trigger using op-amp. Precision half wave and full wave rectifier using op- amp. Sample and hold circuit, peak detector circuit using op-amp. | 5 | - | 20M | 10M |  |
| Learning Outcome | Students will understand   * Working and using Comparators in Industrial and Power electronic circuits. * Precision rectifiers and their need. * Use of Sample and hold ckt and Peak detector circuits in digital communication. | | | | | |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 4 | **Voltage Regulator.**   * 1. Functional Block diagram of voltage regulator. Working and designing terminals voltage   regulators(78XX,79XX).   * 1. Functional block diagram, working designing of general- purpose IC 723 Regulator. 5 - 20M   2. Functional block diagram, working   designing of general-purpose IC LM317 Regulator   * 1. Block diagram of SMPS, comparison between | of |  |  |  | |  |
| Switching and linear regulator | | | | | |
| Learning Outcome | Students will be able to design DC power supply circuits using regulators like IC723, IC 78xx, IC 79xx, LM 317 | | | | | | |
| 5 | **Timer IC 555**   * 1. Functional block diagram, specification and working of   IC555.Design and working of Astable and Monostable | 5 | - | 15 |  |  | |
|  | Multivibrator using 555.  5.2 Application of 555 like VCO, PWM. |  |  |  | 20M |  | |
| Learning Outcome | Students will be able to design and analyze various timer based circuits used in different applications. | | | | | | |
| 6 | **Special purpose Integrated Circuits.**   * 1. Functional block diagram and working of VCO IC 566 and application as frequency modulator.   2. Functional block diagram and   working of PLL IC 565 and application as FSK Demodulator. | 4 | - |  | 10M |  | |
| Learning Outcome | Students will be able to design PLL and VCO’s | | | | | | |
| **\* Insert rows for more modules in the Course**  **Total** | | **30** |  |  |  |  | |

\*\*Learning Outcome should be in bulleted form.

|  |  |
| --- | --- |
| **2.b** | **Prerequisite Courses** |

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Semester | Name of the Course | Topic/s |
| 1 | 1 | Basics of Electrical Engineering. | DC Network theorems. |
| 2 | 3 | Electronic Devices and circuits. | Working and analysis of amplifier circuit  using discrete component. |
|  |  |  |  |

|  |  |
| --- | --- |
| **2.c** | **Relevance to Future Courses** |

|  |  |  |
| --- | --- | --- |
| No. | Semester | Name of the Course |
| 1 | 5 | Analog Integrated circuit  design. |
| 2 | 6 | CMOS Mixed signal VLSI. |

|  |  |  |
| --- | --- | --- |
| **2.d** | **See :- Identify real life scenarios/examples which uses the knowledge of the subject**  **,(Discussion on how to prepare examples and case studies e.g.** [**“Boeing Plane”: C**](https://www.youtube.com/watch?v=ix5jPkxsr7M)[**Programming Language – Intro to Computer Science – Harvard’s CS50 (2018) – Bing video**](https://www.youtube.com/watch?v=ix5jPkxsr7M)**)** | |
| Real Life Scenario | | Concept Used |
| Electronic Gadgets like TV, Cell phone etc. | | Computational circuits using op-amp, Amplification of weak signal. |
| Bio-Medical Instruments, ECG, EEG | | Impedance Matching. High value of CMRR. |

|  |  |
| --- | --- |
| **3** | **Past Results – Division-Wise** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Details | Target – MAY 2025 | DEC 2024 | MAY 2024 | DEC 2023 |
| Course Passing % – Average of 2 Divisions | 100 | NA | 96 | - |
| Marks Obtained by Course Topper (mark/100) | - | - | 40 | - |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Division A | | Division B | |
| Year | Initials of Teacher | % Result | Initials of Teacher | % Result |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| May 2024 | SMA | 94 | ART | 95 |
| May 2023 | - |  |  |  |
| May 2022 |  |  |  |  |

|  |  |
| --- | --- |
| **4** | **All the Learning Resources – Books and E-Resources** |

|  |  |
| --- | --- |
| **4.a** | **List of Textbooks (T – Symbol for Textbooks) to be Referred by Students** |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Sr. No | Textbook Titles | Author/s | Publisher | Edition | Module Nos. | Available in our Library |
| 1 | OP-AMPS AND LINEAR INTEGRTED CIRCUITS | Ramakant.A.Gayakwad | Pearson Prentice Hall | 4th Edition, | All | OP-AMPS AND LINEAR INTEGRTED CIRCUITS |
| 2 | LINEAR INTEGRATED CIRCUITS | D.Roy Choudhary and S.B.Jain | New age International Publishers | 4thEdition. | All | LINEAR INTEGRATED CIRCUITS |

|  |  |
| --- | --- |
| **4.b** | **List of Reference Books (R – Symbol for Reference Books) to be Referred by Students** |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Sr. No | Reference Book Titles | Author/s | Publisher | Edition | Module Nos. | Available in our Library |
| 1 | INTEGRATED CIRCUITS | K.R.Boatkar | Khanna Publishers | 2004 | All | INTEGRATED CIRCUITS |
| 2 | DESIGN WITH OP-AMP AND ANALOG INTEGRATED CIRCUITS | Sergio Franco | Tata McGraw Hill, | 3rd Edition | All | DESIGN WITH OPAMP AND ANALOG INTEGRATED  CIRCUITS |
| 3 | OP-AMP WITH LINEAR INTEGRATED CIRCUITS | David Bell | Oxford University | 2nd Edition | All | OP-AMP  WITH LINEAR |

|  |  |
| --- | --- |
| **4.c** | **List of E - Books (E – Symbol for E-Books) to be Referred by Students** |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Sr. No | E- Book Titles | Author/s | Publisher | Edition | Module Nos. | Available in our Library |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 1 | LINEAR INTEGRATED CIRCUITS | Salivahanan,  N. Suresh Kumar,“ | Tata McGraw Hill, | 3rdEdition | All | LINEAR INTEGRATED CIRCUITS |
| 2 | Op-amps for everyone | Bruce Carter and Ron  Mancini | Newnens, Elseveir. | 3rd | 02 & 03 | Op-amps for everyone |

|  |  |
| --- | --- |
| **4.d** | **Reading latest / top rated research papers (at least 5 papers)** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Name of Paper | Name of Authors (Background) | Published in | | Problem Statement | Available in our Library |
| Date | Journal |
| Design and Analysis of Two- | XiangLiang Jin, Xiang- | 20 Dec  2020 | IEEE  Xplore | Transimpedance amplifier is an | No |
| Stage CMOS | Liang Jin |  |  | important part of the |  |
| Operational |  |  |  | signal processing |  |
| Amplifier for |  |  |  | circuit in the |  |
| Fluorescence |  |  |  | fluorescent optical |  |
| Signal Processing |  |  |  | fiber temperature |  |
|  |  |  |  | sensor to amplify the |  |
|  |  |  |  | current signal and |  |
|  |  |  |  | convert it into a |  |
|  |  |  |  | voltage one. The two- |  |
|  |  |  |  | stage CMOS |  |
|  |  |  |  | operational amplifier, |  |
|  |  |  |  | which can be |  |
|  |  |  |  | designed to achieve |  |
|  |  |  |  | high gain, high CMRR |  |
|  |  |  |  | and low input offset |  |
|  |  |  |  | voltage, can be used |  |
|  |  |  |  | in transimpedance |  |
|  |  |  |  | amplifier circuits. |  |
|  |  |  |  | Based on 0.18 μm |  |
|  |  |  |  | CMOS process, a |  |
|  |  |  |  | two-stage differential |  |
|  |  |  |  | operational amplifier |  |
|  |  |  |  | is designed in this |  |
|  |  |  |  | paper. The simulation |  |
|  |  |  |  | results show that the |  |
|  |  |  |  | gain of the reaches |  |
|  |  |  |  | 85.5dB, the CMRR |  |
|  |  |  |  | and the negative |  |
|  |  |  |  | PSRR are both |  |
|  |  |  |  | around 90dB. The |  |
|  |  |  |  | Miller compensation |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  | circuit in the circuit increases the gain bandwidth of the two-stage CMOS operational amplifier and makes the phase margin reach 80°.  This paper introduces the circuit principle of CMOS two-stage operational amplifier in detail, and according to the simulation result, this operational amplifier meets the index  requirement. |  |
| Flexible and High Throughput Designs of 4- Stage Operational Amplifier | V Avinash kumar  M Mohamad Asan | 24-28  June 2024 | IEEE  Xplore | Operational amplifiers play a major role in analog and mixed signal integrated circuits. This paper proposes flexible and high throughput 4 -stage operational amplifier designs. The former case is flexible to perform the amplifications of 2- stage, 3-stage, and 4- stage. The later case performs two operational amplifications in parallel to improve the throughput. All the existing and proposed designs are implemented using 90 nm CMOS  technology with Cadence. The synthesis results show the proposed high throughput 4- stage operational amplifier I achieves an improvement of  45.6% as compared | No |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  | with the conventional  4stage operational amplifier. |  |
| A Fully Differential Switched Capacitor Amplifier with a Two-Stage Folded-Mesh Class AB Operational Amplifier in a 22 nm FD-SOI CMOS  Process | Jeonwog kooh  Elmer Hlzer | 07  February 2023 | IEEE  Xplore | In this paper, we present a fully differential switched capacitor amplifier with a two-stage folded-mesh class AB operational amplifier, where an internal regulator is employed. The operational amplifier has open-loop DC gain of 147 dB, unity gain bandwidth of 59 MHz, and phase margin of 68 degree at 5 pF load in simulation. 54 dB power supply rejection on the outputs is achieved at 100 kHz, thanks to the internal regulator. The switched capacitor amplifier has voltage gain of 8 and SNDR (Signal-to- Noise and Dynamic Range) of 76.5 dB and SFDR (Spurious- Free Dynamic Range) of 77.3 dBc are obtained by FFT  (Fast-Fourier Transform) spectrum simulation when a 95 mVpeak sinusoidal signal of 12.945 kHz is applied. The switched capacitor amplifier is implemented in a 22 nm FD-SOI (Fully Depleted Silicon-On- Insulator) process. It consumes 2.45 mW  at a sampling clock of | No |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  | 104.2 kHz and  occupies an active die area of 0.0946 mm 2 . |  |
| Slew-Rate Enhancement Circuit of CLASS AB Operational Transconductance Amplifier (OTA) by Auxiliary Circuit | Piepi Liu Li Luo | 23-26  September 2022 | IEEE  Xplore | This paper introduces a slew-rate enhancement (SRE) circuit for CLASS AB Operational Transconductance Amplifier (OTA). The enhancement is achieved by two auxiliary amplifiers.  Simulation results show that CLASS AB OTA with the proposed SRE circuit is achieved 60.  25MV/s positive and  30. 6MV/s symmetric slew rate with a load capacitance of2pF. The positive and negative slew rate of the CLASS AB OTA  with the proposed SRE circuit have increased by a factor of 7.03 and 3.23 respectively. The SRE circuit only work during fast signal transitions with the power consumption  increased by 8.06%. | No |
| Design High gain dual stage operational amplifier using CMOS 45nm  Technology | Srilaxmi Varali Lalitha Maladi. | 10  November 2020 | IEEE  Xplore | Differential amplifier is an analog component. which is used as an amplifier whenever a circuit contains more than one input. A differential amplifier is a basic primitive component in an operational amplifier. Differential amplifier contains three legs. In which two legs for  the input signal to be | No |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  | amplified, the third leg used as output. The differential amplifier can be configured by bipolar technology or with Metal oxide semiconductor technology also.  When the input non- inverted leg which acts as a comparator is applied as input, if any signal applied to invert leg of the differential amplifier it will be used as an amplifier. In this proposed article, the operational amplifier with high gain of 72dB is implemented, the Slew rate of 122 V/μs, Gain bandwidth product of 4.60 MHz Dual-stage operational amplifier will enhance the amplification in a better way when the single-stage amplifier is compared In this article, a dual-stage operational amplifier using CMOS 45nm Technology is  implemented. |  |

|  |  |
| --- | --- |
| **4.e** | **Based on research paper an identify the current Problem statement** |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Problem Statement |  | | Used in | | | | |
| Quiz | Assignmen t | Lab | Mini Project | Poster Presentatio  n | Test | Any Other |
| Reducing output offset voltage for  precise output |  |  |  |  |  |  | Case study. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Achievement of high voltage gain for improving  throughput |  |  |  |  | √ |  |  |
| Increasing the  Unity gain bandwidth | √ |  |  |  |  |  |  |
| Improving the  slew rate. | √ |  |  |  |  |  |  |
| Device  technology. |  |  |  |  | √ |  |  |

|  |  |
| --- | --- |
| **4.f** | **Identify Companies / Industries which use the knowledge of the subject and thus may provide Internships and final Placements** |

|  |  |  |  |
| --- | --- | --- | --- |
| Name of the Company | To be / Contacted for | | |
| Student Internship | Student Final Placement | Faculty Internship |
| NUOS Home Automation. | √ | √ | √ |

|  |  |
| --- | --- |
| **4.g** | **Identify suitable relevant TOP Guest Speakers from Industry,**  **Example: - (CS50 Lecture by Mark Zuckerberg - 7 December 2005 - YouTube)** |

|  |  |  |
| --- | --- | --- |
| Name of the Identified Guest Speaker | Designation | Name of the Company |
| Mr. Rohan Patil | Senior Design Engineer | GOOGLE, Bangalore |

|  |  |
| --- | --- |
| **4.h** | **Identify relevant technical competitions to participate [Competitions -Paper Presentations,**  **Projects, Hackathons, IVs etc..]** |

|  |  |  |
| --- | --- | --- |
| Name of the Relevant Technical Competition Identified to participate | Organized by | Date of the Event |
| SIH | Govt of India. |  |
| TIH | Govt of India. |  |

|  |  |
| --- | --- |
| **4.i** | **Identify faculty in TOP schools / Universities who are teaching same / similar subject and**  **develop rapport e.g. Exchange Lecture Material (Assignments / Tests / Project etc..), Joint Paper Publication** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| University | Name of the  Course | Name of Faculty | Type of Collaboration | | |
| Exchange of Lecture Material | Joint Publication/ Research | Other |
| IIS, Bangal ore | Electronic Systems | Prof. Hardik Pandya |  |  |  |
| IITM | Analog IC design | Prof. S .Anirud han |  |  |  |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **4.j** | **Module Best Available in – Title of the best resource [from *4.a* to *4.d* in this AAP] and other details as necessary** | | | | | | | |
| Module No. | Title of the Module | Textbook as in 4a | Mention the Tile | | | | | |
| Reference Book 4b | Ebooks | Journal | E-  Journal | Available in our Library | V-refer |
| 1 | Introduction to Differential and  Operational Amplifier. | 1&2 | 1&3 | 1&3 |  |  |  |  |
| 2 | Linear applications of Operational Amplifier. | 1&2 | 2 | 2 |  |  |  |  |
| 3 | Non-Linear Application of  Operational amplifier | 1&2 | 2 | 2 |  |  |  |  |
| 4 | Voltage Regulator | 1&2 | 1&3 | 1&3 |  |  |  |  |
| 5 | Timer IC 555 | 1&2 | 2 | 2 |  |  |  |  |
| 6 | Special Purpose Integrated circuits | 1&2 | 1&3 | 1&3 |  |  |  |  |

|  |  |
| --- | --- |
| **4.k** | **Referred to any top-rated university in that subject for content** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| University | Name of the Course | Name of Faculty | Date of Delivery of the Course | Remarks |
| IIT Bombay. | Integrated Circuit and  System | Prof. Shalabh Gupta | Even Sem | All the topics are covered with examples |

|  |  |
| --- | --- |
| **4.l** | **Faculty received any certification related to this subject. List of Certifications Identified / Done** |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Course | Certifying Agency | No. of Hours | Level of the Course | | Certification | | Remarks |
| Introductory | Advance Skill Development | Done on | Proposed to be on |
| NIL |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

|  |  |
| --- | --- |
| **4.m** | **Completed subject wise/cluster wise training with cluster mentor.**  **List of relevant Refresher Course Identified / Done** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Course | Certifying Agency (As suggested by DAB/Cluster  Mentor/Industry/Univ ersity other than MU) | Certification | | Remarks |
| Done on | Proposed to be on |
| Pedagogy | Cluster mentor | Dec 2024 |  | Completed |
| Cluster mentor | Dec 2024 |  | Completed |
| PBL | Cluster mentor | Dec 2024 |  | Completed |
| Cluster mentor | Dec 2024 |  | Completed |
| Sub. Content Training | Cluster mentor | Dec 2024 |  | Completed |
| Cluster mentor | Dec 2024 |  | Completed |

|  |  |
| --- | --- |
| **4.n** | **Best Practices Identified and adopted** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No. | Item | Best Practices Identified | | |
| Univ. 1 | Univ. 2 | Univ. 3 |
| 1 | Microsite | - | - | - |
| 2 | Video Lectures | IIT Bombay | IIT Madras | IISC Bangalore |
| 3 | Assignments | Previous year Gate papers | - |  |
| 4 | Mini Project | IIT Bombay | - | - |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 5 | Assessment Metric | - | - | - |
| 6 | Quizzes | IIT Bombay | - | - |
| 7 | Labs/ Practical (PBL) | IIT Virtual Lab. | - | - |
| 8 | Tests | Previous year Gate papers | - | - |
| 9 | Peer Assessment | - | - | - |
| 10 | Any Other |  |  |  |

|  |  |
| --- | --- |
| **4.o** | **Web Links for Online Notes/YouTube/VIT Digital Content/VIT Lecture Capture/NPTEL Videos** |

Students can view lectures by VIT professors, captured through LMS ‘Lecture Capture’ in VIT campus for previous years.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| No. | Websites / Links | | | | Module Nos. | |
| 1 | <https://www.youtube.com/watch?v=uHQmNWbtwHU> (NPTEL) (Ideal Op-Amp) | | | | 02 | |
| 2 | <https://www.youtube.com/watch?v=nqk714QpRos> (NPTEL) (Op-Amp Applications ) | | | | 03 | |
| 3 | <https://www.youtube.com/watch?v=AOdlsNmJ8Xo> (NPTEL) (Op-Amp Applications) | | | | 03 | |
| 4 | <https://www.youtube.com/watch?v=lJDjWZqhpVc> (Introduction to Op-amps) | | | | 01 | |
| 5 | <https://www.youtube.com/watch?v=pxKLeIjzxAk> (Virtual Ground) | | | | 01 | |
| 6 | <https://www.youtube.com/watch?v=uHQmNWbtwHU> (NPTEL) (Ideal Op-Amp) | | | | 02 | |
|  |  | | | |  | |
| **4.p** | | **Recommended MOOC Courses like Coursera / NPTEL / MIT-OCW / edX/VAC etc.** | | | | |
| 1 | *https://nptel.ac.in/courses/108/108/108108111/* | | Prof. Hardik Jeetendra Pandya -  IISC banglore | 3 months | |  |

|  |  |
| --- | --- |
| **5** | **Consolidated Course Lesson Plan** |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | From (date/month/year) | | From (date/month/year) | | | Total Number of  Weeks | |
| Semester Duration | | | | 06/01/2025 | | 19/04/2025 | | | 15 | |
|  | Lecture no. | Module No. |  | |  | |  | Recommended | |  |
| Week | Lecture Topics | | Actual date of Completion | | Cos | Prior Viewing / Reading | |
| Lecture No.  (on  LMS) | Chapter No. / Page Nos./ Books/ Web Site |
|  | 1 | 1 | •To study the operation, need | |  | | CO1, |  | T1: Chapter1 |
|  |  |  | and working of Operational | | CO2, | page 2 |
| 1 |  |  | amplifiers. | | CO3. | T2: Chapter2 |
| page 56 |
|  |  |  | •To study the various | |  |  |
|  |  |  | parameters of op-amp, their | |  |  |
|  |  |  | significance and calculation. | |  |  |
|  | 2 | 1 | •To analyse and design the | |  | | CO1, |  | T1: Chapter3 |
|  |  |  | various linear circuits using | | CO2, | page 71 |
| 2 |  |  | op-amp. | | CO3. | T2: Chapter2 |
| •Concept of Open and Close | | page 42-50 |
|  |  |  | loop configuration of op-amp | |  |  |
|  |  |  | and its significance. | |  |  |
|  | 3 | 2 | •Analysis of Instrumentation | |  | | CO1, |  | T1: Chapter6 |
| amplifier using 2 and 3 op- | | CO2, | page 207-214 |
| 3 |  |  | amps.  •Numerical on  Instrumentation amplifier. | | CO3. | T2: Chapter4 page 156-160 |
|  |  |  | •Analysis and need of V to I | |  |  |
|  |  |  | and I to V Converters. | |  |  |
|  | 4 | 2 | •Numerical on V to I and I to | |  | | CO1, |  | T1: Chapter1 |
| 4 |  |  | V Converters. | | CO2, | page 2 |
| •Need and types of filters | | CO3. | T2: Chapter2 |
|  |  |  | along with various frequency  response of filters. | |  | page 56 |
|  | 5 | 2 | •Analysis of 1st and 2nd order | |  | | CO1, |  | T1: Chapter1 |
| 5 |  |  | filters.  •Designing of 1st and 2nd order filters. | | CO2, CO3. | page 2  T2: Chapter2 page 56 |
|  | 6 | 2,3 | Designing of 1st and 2nd | |  | | CO1, |  | T1: Chapter1 |
|  |  |  | order filters. | | CO2, | page 2 |
| 6 |  |  | •Working application and | | CO3. | T2: Chapter2 |
| transfer characteristics of | | page 56 |
|  |  |  | comparator circuit using op- | |  |  |
|  |  |  | amp. | |  |  |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 7 | 7 | 3 | •Working application and transfer characteristics of comparator circuit using op- amp.  •Working and application of sample and hold circuit using op-amp.  •Working and application of  Peak detector circuit using op-amp. |  | CO1, CO2, CO3. |  | T1: Chapter1 page 2  T2: Chapter2 page 56 |
| 8 | 8 | 3 | •Working analysis hysteresis curve and numerical on Schmitt-trigger using op- amp.  •Concept and working of  Precision half and full wave rectifier using op-amp. |  | CO1, CO2, CO3. |  | T1: Chapter1 page 2  T2: Chapter2 page 56 |
| 9 | 9 | 4 | •To study Block diagram and working of Timer IC555.  •Various types of  Multivibrators. |  | CO2, CO3, CO4 |  | T1: Chapter1 page 2  T2: Chapter2  page 56 |
| 10 | 10 | 4 | •Working analysis designing and application of Monostable multivibrator using IC555.  •Working analysis designing and application of Astable multivibrator using IC555. |  | CO2, CO3, CO4 |  | T1: Chapter1 page 2  T2: Chapter2 page 56 |
| 11 | 11 | 4,5 | •VCO and PWM using IC555.  •Basic building block of linear voltage regulator circuits.  •Circuits for over voltage and current protection in regulator circuits. |  | CO2, CO3, CO4 |  | T1: Chapter1 page 2  T2: Chapter2 page 56 |
| 12 | 12 | 5 | •Block diagram working and designing of voltage regulator circuits using three pin voltage regulator IC 78XX  ,79XX  •Block diagram working and designing of voltage regulator circuits using three  pin variable voltage regulator IC LM318. |  | CO2, CO3, CO4 |  | T1: Chapter1 page 2  T2: Chapter2 page 56 |
| 13 | 13 | 5 | •Block diagram working and designing of voltage regulator circuits IC723. |  | CO2, CO3, CO4 |  | T1: Chapter1 page 2  T2: Chapter2 page 56 |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 14 | 14 | 6 | Block diagram and working of VCO IC566 |  | CO2, CO3, CO4 |  | T1: Chapter1 page 2  T2: Chapter2 page 56 |
| 15 | 15 | 6 | To study Block diagram and working of PLL IC565. |  | CO2, CO3, CO4 |  | T1: Chapter1 page 2  T2: Chapter2 page 56 |

|  |  |
| --- | --- |
| **6** | **Rubric for Grading and Marking of Term Work (inform students at the beginning of**  **semester)** |

* Activity/ies should be designed as per reference of credit structure.
* If the subject is of 2 credit, activity/ assignment should be design for 2 hours with appropriate complexity and engaging time.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Theory (ISA=15M) 5 marks for BSA | | | | | | | |  |  |  |  | Total Best 10 |
| Class Participation |  |  |  |  |  |  |  |  |  |  |  |
| 5 | Assign | Assign | Assign | Assign | Assign | Assign | Assign | Assign | Assign | Assign | Assign | 5 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Practical (ISA=25) 10M attendance, 5 Mini Project | | | | | | | |  |  |  |  | Total |
| Class Participation |  |  |  |  |  |  |  |  |  |  |  |
| 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Class Participation | MSE-1 | MSE-2 | ESE | Total |
| 15 | 20 | 20 | 40 | 75 |

|  |  |
| --- | --- |
| **7** | **Assignments / Tutorials Details** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Assignment/ Tutorial No. | Title of the Assignments / Tutorials | CO  Map | Mapping Bloom Taxonomy  Level | Assignment/ Tutorials given to Students on | Assignments to be submitted  back on |
| 1 | Numerical on Linear circuit of op-amp | CO1 CO2 CO3 | Understand, Analyze, Design. | 4th week | 5th week |
| 2 | Numerical on arithmetic building block of  op-amp | CO1 CO2 CO3 | Understand, Analyze, Design. | 6th week | 7th week |
| 3 | Numerical on Linear application of op- amp. | CO1 CO2 CO3 | Understand, Analyze, Design. | 7th week | 8th week |
| 4 | Designing of Butterworth filter using op- amp. | CO1 CO2 CO3 | Understand, Analyze, Design. | 8th week | 9th week |
| 5 | Comparator and Schmitt Trigger. | CO1 CO2 CO3 | Understand, Analyze, Design. | 9th week | 10th week |
| 6 | Numerical on Precision Rectifier. | CO1 CO2 CO3 | Understand, Analyze, Design. | 10th week | 11th week |
| 7 | Numerical on Astable multivibrator using  IC555. | CO2 CO3 CO4 | Understand, Analyze, Design. | 11th week | 12th week |
| 8 | Design circuit using IC555. | CO2 CO3 CO4 | Understand, Analyze, Design. | 12th week | 13th week |
| 9 | Three pin Fixed Voltage Regulator. | CO2 CO3 CO4 | Understand, Analyze, Design. | 13th week | 14th week |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 10 | Numerical on variable voltage regulator using IC723. | CO2 CO3 CO4 | Understand, Analyze, Design. | 14th week | 15th week |
| 11 | VCO and PLL. | CO2 CO3 CO4 | Understand, Analyze, Design. | 15th week | 16th week. |

**Analysis of Assignment / Tutorial Questions and Related Resources**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Type\* (√) | | | Module No. | Based on # | | | Question Type (√) | |
| OT | CS | DTP | Textbook | Reference Book | Other Learning Resource | Real Life Assignments | Thought Provoking |
| 1 | 3 | √ | √ |  | 1 | T1, T2 | R1 R2 | NPTEL LECTURES |  | √ |
| 2 | 4 | √ |  |  | 1 | T1, T2 | R1 R2 | NPTEL LECTURES |  | √ |
| 3 | 5 | √ | √ |  | 2 | T1, T2 | R1 R2 | NPTEL LECTURES | √ |  |
| 4 | 6 | √ |  |  | 2 | T1, T2 | R1 R2 | NPTEL LECTURES | √ |  |
| 5 | 7 | √ |  |  | 3 | T1, T2 | R1 R2 | NPTEL LECTURES |  | √ |
| 6 | 8 | √ |  |  | 3 | T1, T2 | R1 R2 | NPTEL LECTURES | √ |  |
| 7 | 9 | √ |  |  | 4 | T1, T2 | R1 R2 | NPTEL LECTURES | √ |  |
| 8 | 10 | √ |  |  | 4 | T1, T2 | R1 R2 | NPTEL LECTURES | √ | √ |
| 9 | 11 | √ |  |  | 5 | T1, T2 | R1 R2 | NPTEL LECTURES | √ |  |
| 10 | 12 | √ |  |  | 5 | T1, T2 | R1 R2 | NPTEL LECTURES | √ |  |
| 11 | 13 | √ |  |  | 6 | T1, T2 | R1 R2 | NPTEL LECTURES | √ |  |

\* Tick (√) the Type of the Assignment: Online Tools (OT); Collaborative Assignments (CS); Design /Thought provoking (DTP)

# Write number for textbook, reference book, other learning resource from this AAP – *from Points 4.a to 4.d*

|  |  |
| --- | --- |
| **8** | **In Semester Assessment (ISE) / Other Class Test / Open Book Test (OBT)/Take Home Test (THT) Details** |

**\* Failures of IA test (IA1+IA2) shall appear for IA test in the next semester. There is no provision for re- test in the same semester.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Tests | Test Dates | Module No. | CO Map | MSE Question Paper Pattern | Policy |
| MSE | As per College schedule. Every Monday there will be test for MSE. Total 3 Test will be conducted of 20 Marks each for MSE. | ALL MODULES | ALL CO’S. | 20 Marks paper.  There will be 4 questions. Q1 to Q4. Each question will be having 3 sub question a,b,c. In part a question will come from topics taught in class and it will be carrying  2. 5marks.In part b Questions will be like Assignment questions and it will carry 5 marks. In part c  question will come from previous year Gate paper and it will also carry  5 marks. | Test will be taken on Mondays as per timetable given by Exam section.  Test1- Module1,2 Test2- Module3,4 Test3- Module5,6. |
| Pop Quiz | 1ST POP-QUIZ  will be taken after finishing first 2 Modules and 2nd POP- QUIZ will be taken after finishing  Module3 and 4. | 1,2,3,4 | CO1 CO2 CO3. |  | MCQ Based. |
| Open Book Test |  |  |  |  |  |
| Take Home  Test |  |  |  |  |  |
| Class tests  / prelims |  |  |  |  |  |
| Class tests  / prelims |  |  |  |  |  |
| Any other test/exams |  |  |  |  |  |

|  |  |
| --- | --- |
| **9.** | **Practical Activities** |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Practical No. | Module No. | Title of the **Experiments** | Type of Experiment | | Topics to be highlighted | CO  Map |
| PBL | Newly Added |
| 1 | 1 | Design inverting and non-inverting amplifiers (DC & AC) using op-amp ic741. Verify its theoretical and practical gain values. Also plot its frequency  response. |  |  | Linear circuit application | CO1 CO2 CO3 |
| 2 | 2 | Design and Implement Arithmetic circuits using op-amp IC741. |  |  | Linear  circuit application | CO1  CO2 CO3 |
| 3 | 2 | Design and Implement 1st order Low and High Pass Butterworth Filter Using op- amp IC741. |  |  | Filter | CO1 CO2 CO3 |
| 4 | 2 | Design and Implement 2nd order Low  and High Pass Butterworth Filter Using op-amp IC741. |  |  | Filter | CO1 CO2 CO3 |
| 5 | 2 | Design & Implement Basic and Practical Integrator circuit using op-amp IC741. |  |  | Linear  circuit application | CO1  CO2 CO3 |
| 6 | 2 | Design & Implement Basic and Practical Differentiator circuit using op-amp IC741. |  |  | Linear circuit application | CO1 CO2 CO3 |
| 7 | 3 | Implement Inverting and Non-inverting Comparator circuit using op-amp IC741. |  |  | Comparator | CO2 CO3  CO4 |
| 8 | 3 | Design and Implement Non-inverting Schmitt-Trigger circuit Using IC741. |  |  | Schmitt Trigger | CO2  CO3 CO4 |
| 9 | 5 | Design and Implement Astable Multivibrator circuit using IC555. |  |  | Timer Application | CO2  CO3 CO4 |
| 10 | 5 | Design and Implement VCO circuit using IC555. |  |  | Timer Application | CO2 CO3  CO4 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 11 | 4 | Design and Implement Fixed voltage regulator using 78XX & 79XX |  |  | Voltage regulator | CO2 CO3  CO4 |
| 12 | 4 | Design and implement variable voltage regulator using IC723. |  |  | Voltage regulator | CO2 CO3  CO4 |

|  |  |
| --- | --- |
| **10** | **Uncovering syllabus with different Activities.** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No. | Type of the Activity | Activities | Number of beneficiaries | Other Details – guest profile, feedback, mark sheet, report |
| 1 | **Experiential**  **learning/Interaction with Outside World** | 1- Guest Lectures by Industry Expert | ALL STUDENTS. | Mr Rohan Pawar  Front end Design Engineer at  GOOGLE Bangalore. |
| 2- Workshops |  |  |
| 3- Mini Project | ALL STUDENTS. |  |
| 4- Industrial Visit | ALL STUDENTS |  |
| 5- Any other activity |  |  |
| 2 | **Collaborative & Group Activity** | 6- Poster Presentation | ALL STUDENTS. |  |
| 7- Minute Papers |  |  |
| 8- Students Seminars | ALL STUDENTS. |  |
| 9- Students Debates |  |  |
| 10- Panel Discussion  /  Mock GD |  |  |
| 11- Mock Interview |  |  |
| 12- Any other activity |  |  |
| 3 | **Co-Curricular Activity** | 13- Informative videos (NPTEL/YouTube  /TEDx/ MIT OW/edX) |  |  |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | | | 14- Lecture Capture Usage | | ALL STUDENTS. |  |
|  |  | | | 15- Any other activity | |  |  |
| 4 | **Tests & Assessments** | | | 16- Class Tests/ Weekly  Tests | | ALL STUDENTS. |  |
| 17- Pop Quiz | | ALL STUDENTS |  |
| 18- Mobile App Based  Quiz | |  |  |
| 19- Open Book Test | |  |  |
| 20- Take Home Test | |  |  |
| 21- Any other activity | |  |  |
| **11** | | **AAP** | | | | | |
| No. | Programme | | Course | | Uploaded on V-refer | | Date |
| 1 | EXTC | | Integrated Circuits | | Yes | | 07/01/2025 |
|  |  | |  | |  | |  |
|  |  | |  | |  | |  |

|  |  |
| --- | --- |
| **12** | **Lecture Guide** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No. | Programme | Course | Uploaded on V-refer | Date |
| 1 | EXTC | Integrated circuits | Yes | 07/01/2025 |
|  |  |  |  |  |
|  |  |  |  |  |

**\* Do not delete any activity. Give details for planned events. Write ‘NA’ for activity Not Planned.**

Consolidated Academic Administration Plan Prepared by (mention all theory teaching faculty names with signature)

Please write below your name and sign with date of the external cluster mentor meeting

|  |  |  |
| --- | --- | --- |
| Prof. Satendra Mane Faculty 1 | Prof. Ananad Tripathi Faculty 2 | Faculty 3 |

|  |  |  |  |
| --- | --- | --- | --- |
| Mr Neil Sawant External Industry Mentor | Dr S.S.Mande External Academic Mentor | Prof. Satendra Mane VIT Cluster Mentor | Dr. Varsha Turkar. Program HOD |