**GOVERNMENT POLYTECHNIC**

**CHHAPRA**



COURSE FILE (Lecture Plan)

OF

**ELECTRONIC DEVICES AND CIRCUITS** **(2021302)**

Faculty Name:

Prof. SAURAV KUMAR

Lecturer

**DEPARTMENT OF ELECTRONICS ENGINEERING**

|  |
| --- |
| **STATE BOARD OF TECHNICAL EDUCATION** |
| Bihar, Patna  SS.JPG  &  CC.JPG |

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Department of Electronics Engineering

**Vision**

To be a Centre of excellence in the field of Electronics Engineering offering value-based world class education and research producing well qualified engineers, who can contribute favorably to the technological and socio-economic development of the nation.

**Mission**

1. To ensure sufficient modern technological exposure to the students in order to create skilled professionals.

2. To frequently update the labs keeping in view the requirement of the current industry scenario.

3. To extend counseling and career guidance facility to the students to help them to achieve their goal.

4. To encourage faculties and staffs to pursue higher education and to do the research work.

5. To encourage faculties and staffs to participate in various seminars, conferences and workshops to keep themselves updated of the state-of-the-art technology.

**Course Description: -**

You may be new to Electronic Devices and Circuits or you have already Studied Electronic Devices and Circuits but still you feel you need to learn more about Electronic Devices and Circuits in detail so that it helps you solve challenging problems.

Electronic Devices and Circuits (EDC) is a fundamental course for Electronics Students. Electronic Devices play a very important role in our day-to-day life.

The device which controls the flow of electrons is called electronic device. These devices are the main building blocks of electronic circuits.

Modern Electronics has come to be known as microelectronics which refers to the Integrated Circuits (ICs) containing millions of discrete devices. This course introduces some of the basic electronic devices like diodes and different types of transistors. It also aims to introduce students the analysis and design techniques of circuits involving these discrete devices as well as the integrated circuits. Completion of this course is essential to specialize in Electrical, Telecommunication or Computer Engineering stream.

**Course Objectives: -**

The aim of this course is to help the students to attain the following industry identified competency through various teaching learning experiences:

* To introduce basic semiconductor devices, their characteristics and application.
* To understand analysis and design of simple diode circuit.
* To learn to analyze the PN junction behavior at the circuit level and its role in the operation of diodes and active device.

**Course Syllabus**

**ELECTRONIC DEVICES AND CIRCUITS (ELECTRONICS ENGINEERING GROUP)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject Code 2021302** | **Theory** | | |  | | | **Credits** |
| **No. of Periods Per Week** | | | **Full Marks** | **:** | **100** | **04** |
| **L** | **T** | **P/S** | **ESE** | **:** | **70** |
| **03** | **-** | **-** | **TA** | **:** | **10** |
| **-** | **-** | **-** | **CT** | **:** | **20** |

|  |  |  |
| --- | --- | --- |
| **Chapter** | **Name of the Topic** | **Hours** |
| **Unit I** | **Semiconductor and Diodes**  Definition, Extrinsic/Intrinsic, N-type & p-type PN Junction Diode – Forward and Reverse Bias Characteristics Zener Diode – Principle, characteristics, construction, working Diode Rectifiers – Half Wave and Full Wave. Filters – C, LC and PI Filters. | **14** |
| **Unit II** | **Bipolar Junction Transistor (BJT)**  NPN and PNP Transistor – Operation and characteristics Common Base Configuration – characteristics and working Common Emitter next line Configuration – characteristics and working Common Base Configuration – characteristics and working, High frequency model of BJT. Classification of amplifiers, negative feedback. | **14** |
| **Unit III** | **Field Effect Transistors**  FET – Working Principle, Classification MOSFET Small Signal model N-Channel/ P-Channel MOSFETs – characteristics, enhancement and depletion mode, MOS- FET as a Switch Common Source Amplifiers Uni-Junction Transistor – equivalent circuit and operation. | **12** |
| **Unit IV** | **SCR, DIAC & TRIAC**  SCR – Construction, operation, working, characteristics, DIAC - Construction, operation, working, characteristics, TRIAC - Construction, operation, working, characteristics, SCR and MOSFET as a Switch, DIAC as bidirectional switch Comparison of SCR, DIAC, TRIAC, MOSFET. | **10** |
| **Unit V** | **Amplifiers and Oscillators**  Feedback Amplifiers – Properties of negative Feedback, impact of feedback on different parameters Basic Feedback Amplifier Topologies: Voltage Series, Voltage Shunt, Current Series, Current Shunt Oscillator – Basic Principles, Crystal Oscillator, Non-linear/ Pulse Oscillator. | **10** |
|  | **TOTAL** | **60** |

**References:**

|  |  |  |  |
| --- | --- | --- | --- |
| **S. No.** | **Title of Book** | **Author** | **Publication** |
| 1. | Analog Circuits | A.K. Maini | Khanna Publishing House  Ed. 2018 (ISBN: 978-93-86173-584) |
| 2. | Electronic Devices and Circuits | S. Saliva Hanan and  N. Suresh Kumar | McGraw Hill Education; Fourth edition (1 July 2017)  ISBN: 978-9339219505 |
| 3. | Electronics Devices and circuit theory | Boylested & Nash- Elsy | Pearson Education India; 11 edition (2015)  ISBN: 978-9332542600 |
| 4. | Electronic Principles | Albert Melvino & David Bates | Tata McGraw Hill Publication 2010 ISBN: 978-0070634244 |
| 5. | Electronics Devices & Circuits | Jacob Millman | McGraw Hill Education; 4 edition (2015)  ISBN: 978-9339219543 |

**Course outcomes:**

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry-oriented COs associated with the above-mentioned objective:

1. Understand the working principle of PN junction diode and rectifiers.

2. Use transistor as low power amplifier.

3. Use MOSFET as switch and high-power applications.

4. Understand the working principle and characteristics of SCR, DIAC and TRIAC.

5. Use BJT as feedback amplifier and waveform generator.

6. Electronic Devices and Circuits

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**TIME TABLE**

**FACULTY: -** Prof. Saurav Kumar (Electronics Engineering Department)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1st  10:00-11:00 | 2nd  1:00-12:00 | 3rd  12:00-1:00 |  | 4th  2:00-3:00 | 5th  3:00-4:00 | 6th  4:00-5:00 |
| MON |  | **Electronics Devices & Circuit (2021302) (Saurav)** |  | L  U  N  C  H |  |  |  |
| TUE |  | **Electronics Devices & Circuit (2021302) (Saurav)** |  |  |  |  |
| WED |  | **Electronics Devices & Circuit (2021302) (Saurav)** |  |  |  |  |
| THU |  | **Electronics Devices & Circuit (2021302) (Saurav)** |  |  |  |  |
| FRI |  |  |  |  |  |  |
| SAT |  |  |  |  |  |  |

**GOVERNMENT POLYTECHNIC CHAPRA**

**CLASS ROUTINE FOR DIPLOMA 3RD SEMESTER EC- Electronics Engineering**

**Student list**

**Electronics Engineering.**

|  |  |
| --- | --- |
| **Branch-Electronics Engg.** | |
| **Roll Number** | **Name Of the Student** |
| 311132121001 | OMPRAKASH GIRI |
| 311132121002 | SHIVAM KUMAR |
| 311132121003 | ASTHA KUMARI |
| 311132121004 | RITESH KUMAR |
| 311132121005 | RESHMI KUMARI |
| 311132121006 | PUSHP RAJ SINGH |
| 311132121007 | ANWESHA SINGH |
| 311132121009 | SUNNY KUMAR |
| 311132121011 | RAJ DEEPAK |
| 311132121012 | PINTU KUMAR |
| 311132121013 | AMAR RAJ |
| 311132121014 | NEHA KUMARI |
| 311132121015 | BEAUTY KUMARI |
| 311132121016 | VISHAL KUMAR |
| 311132121017 | SANDEEP KUMAR |
| 311132121019 | HASAN RAJA |
| 311132121020 | ANKIT KUMAR |
| 311132121021 | ROHIT KUMAR |
| 311132121022 | VIKASH KUMAR |
| 311132121024 | MOHIT KUMAR |
| 311132121025 | ALOK KUMAR SINGH |
| 311132121026 | MONU KUMAR |
| 311132121027 | MONU KUMAR |
| 311132121028 | AMAN KUMAR |
| 311132121029 | ROHIT KUMAR |

|  |  |
| --- | --- |
| 311132121030 | PRINCE KUMAR |
| 311132121031 | GAUTAM RANJAN |
| 311132121034 | DINKAR KUMAR |
| 311132121036 | AMAN KUMAR |
| 311132121037 | ROZEE KHATOON |
| 311132121038 | RANJEET KUMAR |
| 311132121039 | PRATAP KUMAR SHARMA |
| 311132121040 | RAHUL KUMAR |
| 311132121042 | RAUSHAN KUMAR |
| 311132121043 | AJAY KUMAR |
| 311132121044 | ANIKET KUMAR CHOUDHARY |
| 311132121045 | POOJA KUMARI |
| 311132121301 | RITESH KUMAR GUPTA |
| 311132121302 | GOVIND KUMAR SAHANI |
| 311132121303 | PUSHPA KUMARI |

**LECTURE PLAN**

|  |  |
| --- | --- |
| **Topics** | **Lecture Number** |
| ***Semiconductor and Diodes*:** | **01-14** |
| Definition | 1-2 |
| Extrinsic/Intrinsic , N-type & p-type | 3-4 |
| PN Junction Diode | 5 |
| PN Junction Diode – Forward and Reverse Bias Characteristics | 6-7 |
| Zener Diode – Principle | 8 |
| Zener Diode –characteristics, construction, working | 9-10 |
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| Common Base Configuration – characteristics | 19-20 |
| Common Base Configuration –working | 17-18 |
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| Classification of amplifiers | 27 |
| negative feedback | 28 |
| ***Field Effect Transistors*:** | **29-40** |
| FET – working principle | 29-30 |
| Classification MOSFET Small Signal model | 31-32 |
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| MOS- FET as a Switch Common Source Amplifiers | 39 |
| Uni-Junction Transistor – equivalent circuit and operation | 40 |
| ***SCR, DIAC & TRIAC*:** | **41-50** |
| SCR – Construction, operation, working, characteristics | 41-42 |
| DIAC - Construction, operation, working, characteristics | 43-44 |
| TRIAC - Construction, operation, working, characteristics | 45 |
| SCR and MOSFET as a Switch | 46 |
| DIAC as bidirectional switch Comparison of SCR | 47 |
| DIAC | 48 |
| TRIAC | 49 |
| MOSFET | 50 |
| ***Amplifiers and Oscillators*:** | **51-60** |
| Feedback Amplifiers – Properties of negative Feedback | 51-52 |
| Impact of feedback on different parameters | 53 |
| Basic feedback amplifier topologies: voltage series, voltage shunt, current series | 54-55 |
| Amplifier topologies: current series, current shunt | 56-57 |
| Oscillator – basic principles, crystal oscillator | 58-59 |
| Non-linear/ Pulse Oscillator | 60 |

**This document is approved by**

|  |  |  |
| --- | --- | --- |
| **Designation** | **Name** | **Signature** |
| Course Coordinator | Prof. Saurav Kumar |  |
| HoD | Prof. Om Prakash Aditya |  |
| Principal | Dr. Anil Kumar Singh |  |
| Date |  |  |