

FR. CONCEICAO RODRIGUES COLLEGE OF ENGINEERING
Department of Electronics & Computer Science

THEORY LESSON PLAN FOR EDC – I (ELX 302)

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| Class & Division | S.E. (Electronics Engineering) – Semester III | | |
| Academic Term | 1 st July 2019 to 18 th October 2019 (1 st Half / Odd Term) | | |
| Subject Name | Electronic Devices & Circuits – I (EDC – I) – ELX 302 | | |
| Faculty I/C | Jayen Modi | | |
| Periods (Hours) per week | Lectures | 04 Hours / Week | |
| | Practicals | 02 Hours / Week | |
| | Tutorials | --- | |
| Evaluation System | | Hours | Marks |
| | Theory Examination | 3 | 80 |
| | Internal Assessment | 1 | 20 |
| | Practical Examination | --- | 25 |
| | Oral Examination | --- | --- |
| | Term work | --- | 25 |
| | Total | --- | 150 |
| Time Table | Days | Timings | |
| | Mondays | 12 noon to 01:00 pm | |
| | Tuesdays | 08:45 am to 09:45 am | |
| | Thursdays | 01:30 pm to 02:30 pm | |
| | Fridays | 11:00 am to 12 noon | |

COURSE CONTENTS & LESSON PLAN

| Week No. | Lecture No. | Dates | | Topics Planned to be Covered | Course Outcomes (CO) Addressing | Programme Outcomes (PO) | Assignments / Experiments | Teaching Aids | Remarks |
|----------|-------------|------------|-----------|---|---------------------------------|-------------------------|---------------------------|-----------------------------|---------------------|
| | | Scheduled | Conducted | | | | | | |
| 1 | 1 | 01/07/2019 | | Introduction to the course / subject EDC – I (ELX 302) with course objectives, course outcomes (CO) & the mapping with programme outcomes (PO) & academic administration | | | | Handouts | NBA |
| 1 | 2 | 03/07/2019 | | Revision of semiconductor physics, concept of energy band gap, introduction to semiconductors, intrinsic semiconductor, doping, extrinsic semiconductor, types of impurities (trivalent & pentavalent), the PN junction | ELX 302.1 | PO-1 & PO-2 | | Chalk, duster & black board | |
| 1 | 3 | 04/07/2019 | | Energy band diagram of PN junction under zero / no external biasing, forward biasing & the reverse biasing condition along with brief explanation of each case | ELX 302.1 | PO-1 & PO-2 | | Chalk, duster & black board | |
| 1 | 4 | 05/07/2019 | | Introduction to the PN junction diode, construction, symbol & V-I characteristics in forward & reverse bias, operation & the definition of some important terms | ELX 302.2 | PO-1 | Experiment No. 1 | Chalk, duster & black board | Syllabus for UT – 1 |

Lesson Plan of EDC – I (ELX 302) for S.E. (Electronics Engineering) – Semester III (2019 – 2020)

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| 2 | 5 | 08/07/2019 | | Introduction to the DC load line & concept of operating point (Q – point) in PN junction diode, numerical examples on the calculation of Q – point of PN junction diode circuit | ELX 302.1 & ELX 302.2 | PO-1 & PO-2 | | Chalk, duster & black-board | Syllabus for UT – 1 |
| 2 | 6 | 10/07/2019 | | Diffusion & transition capacitances in PN junction diode, their origin, mathematical equations, the impact of transition & the diffusion capacitances on diode operation | ELX 302.2 | PO-1 | | PPT | Syllabus for UT – 1 |
| 2 | 7 | 11/07/2019 | | AC equivalent circuit / mathematical model of the PN junction diode, its applications, analysis of diode circuits using the AC equivalent mathematical model (small signal model) | ELX 302.2 | PO-1 | | PPT | |
| 2 | 8 | 12/07/2019 | | PN junction current, drift & diffusion current, temperature on the PN junction diode effects, mathematical analysis of the changes in temperature on PN junction diode current | ELX 302.1 & ELX 302.2 | PO-2 | | Chalk, duster & black-board | Syllabus for UT – 1 |
| 3 | 9 | 15/07/2019 | | Introduction to diode based series clipper circuits – biased & unbiased clipper, negative & positive clipper, input & output waveforms with transfer characteristics | ELX 302.1 & ELX 302.2 | PO-2 | Experiment No. 2 | PPT | YouTube Video |
| 3 | 10 | 16/07/2019 | | Introduction to diode based shunt clipper circuits – biased & unbiased clipper, negative & positive clipper, input & output waveforms with transfer characteristics | ELX 302.3 | PO-2 | Experiment No. 2 | PPT | YouTube Video |
| 3 | 11 | 18/07/2019 | | Introduction to diode unbiased clamper circuits – negative & positive clamper, input & output waveforms along with transfer characteristics & their working / operation | ELX 302.3 | PO-2 | Experiment No. 2 | PPT | YouTube Video |
| 3 | 12 | 19/07/2019 | | Introduction to the diode positively biased positive & negative clamper circuits – input & output waveforms along with transfer characteristics & their working / operation | ELX 302.3 | PO-2 | Experiment No. 2 | PPT | YouTube Video |
| 4 | 13 | 22/07/2019 | | Introduction to the diode negatively biased positive & negative clamper circuits – input & output waveforms along with transfer characteristics & their working / operation | ELX 302.3 | PO-2 | Experiment No. 2 | Chalk, duster & black-board | |
| 4 | 14 | 23/07/2019 | | Introduction to diode half-wave rectifier, theory of operation / working, circuit diagrams, input & output waveforms along with advantages & disadvantages | ELX 302.5 | PO-9 | | Chalk, duster & black-board | |

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| 4 | 15 | 25/07/2019 | | Introduction to diode full-wave center-tap & full-wave bridge type rectifier, theory of operation & working, circuit diagrams, input & output waveforms with advantages & disadvantages | ELX 302.5 | PO-9 | | Chalk, duster & black-board | |
| 4 | 16 | 26/07/2019 | | Analysis of a diode half-wave rectifier, derivation of the output voltage (DC) value & RMS value, derivation of the transformer utilization factor (TUF) | ELX 302.4 | PO-1 & PO-2 | | Chalk, duster & black-board | |
| 5 | 17 | 29/07/2019 | | Analysis of a diode full-wave rectifier, derivation of the output voltage (DC) value & RMS value, derivation of the transformer utilization factor (TUF) | ELX 302.4 | PO-1 & PO-2 | Experiment No. 7 | Chalk, duster & black-board | |
| 5 | 18 | 30/07/2019 | | Capacitor (C) type filter – circuit diagram, operation / working, input & output waveforms, advantages & disadvantages, the ripple factor (γ) derivation | ELX 302.4 | PO-1 & PO-2 | | Chalk, duster & black-board | |
| 5 | 19 | 01/08/2019 | | Inductor (L) type filter – circuit diagram, operation / working, input & output waveforms, advantages & disadvantages, the ripple factor (γ) derivation | ELX 302.4 | PO-1 & PO-2 | | Chalk, duster & black-board | |
| 5 | 20 | 02/08/2019 | | Inductor – Capacitor (L-C) type filter with the circuit diagram, operation / working, input & output waveforms, advantages & disadvantages, the ripple factor (γ) derivation | ELX 302.4 | PO-1 & PO-2 | | Chalk, duster & black-board | |
| 6 | 21 | 05/08/2019 | | C-L-C (π) type filter – circuit diagram, operation / working, input & output waveforms, advantages & disadvantages, the ripple factor (γ) derivation | ELX 302.4 | PO-1 & PO-2 | Assignment No. 1 | Chalk, duster & black-board | |
| 6 | 22 | 06/08/2019 | | Introduction to voltage regulators, Zener diode operation & its V-I characteristics, analysis of Zener diode voltage regulators with numerical examples | ELX 302.2 & ELX 302.3 | PO-1 | | PPT | Hand-outs (notes) |
| 6 | 23 | 08/08/2019 | | Transistorized series voltage regulator, circuit diagram & its construction, theory of operation / working, advantages & its disadvantages, numerical examples | ELX 302.2 & ELX 302.3 | PO-1 | | PPT | Hand-outs (notes) |
| 6 | 24 | 09/08/2019 | | Transistorized shunt voltage regulator, circuit diagram & its construction, theory of operation / working, advantages & its disadvantages, numerical examples | ELX 302.2 & ELX 302.3 | PO-1 | | PPT | Hand-outs (notes) |

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| 7 | -- | 12/08/2019 | 12/08/2019 | HOLIDAY ON ACCOUNT OF BAKRI ID | | | | | Academically Off |
| 7 | -- | 13/08/2019 | 13/08/2019 | UNIT TEST NO. 1 | | | | | Academically Off |
| 7 | -- | 15/08/2019 | 15/08/2019 | HOLIDAY ON ACCOUNT OF INDEPENDENCE DAY | | | | | Academically Off |
| 7 | -- | 16/08/2019 | 16/08/2019 | UNIT TEST NO. 1 | | | | | Academically Off |
| 8 | 25 | 19/08/2019 | | Bipolar junction transistor (BJT), structure & construction, the symbols & types, voltages & currents, configurations, the Early Effect, modes of operation | ELX 302.2 | PO-1 | | PPT | |
| 8 | 26 | 20/08/2019 | | V-I characteristics, DC load line & Q – point analysis, fixed operating point, numerical examples on the DC load line & the Q – point, graphical analysis | ELX 302.2 | PO-1 & PO-2 | Experiment No. 3 | Chalk, duster & black-board | |
| 8 | 27 | 22/08/2019 | | Reverse saturation leakage current in BJT, concept of stability with definitions of various stability factors, derivation of general equation of stability factor (S_{ICO}) | ELX 302.2 | PO-1 | | Chalk, duster & black-board | |
| 8 | 28 | 23/08/2019 | | BJT fixed base & modified fixed base biasing, circuit analysis, theory of operation / working, advantages & disadvantages, numerical examples | ELX 302.3 | PO-1 & PO-2 | | Chalk, duster & black-board | |
| 9 | 29 | 26/08/2019 | | BJT collector-to-base biasing & the modified collector-to-base bias, circuit analysis, theory of operation, working, advantages & disadvantages, numerical examples | ELX 302.3 | PO-1 & PO-2 | | Chalk, duster & black-board | |
| 9 | 30 | 27/08/2019 | | BJT voltage divider biasing, circuit analysis, theory operation & working, advantages & disadvantages, numerical examples, comparison of all different BJT biasing circuits | ELX 302.3 | PO-1 & PO-2 | Experiment No. 4 | Chalk, duster & black-board | |

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| 9 | 31 | 29/08/2019 | | AC load line in BJT, small signal (AC) models (h-parameter model, the r_e model, the hybrid – π model), graphical analysis & AC equivalent circuits | ELX 302.2 | PO-3 | | PPT | |
| 9 | 32 | 30/08/2019 | | Introduction to concept of small signal amplifier, definition of input resistance (R_i), output resistance (R_o), voltage gain (A_v), current gain (A_i) | ELX 302.1 | PO-3 | | PPT | YouTube Video |
| 10 | -- | 02/09/2019 | 02/09/2019 | MID – TERM BREAK | | | | | Academically Off |
| 10 | -- | 03/09/2019 | 03/09/2019 | MID – TERM BREAK | | | | | Academically Off |
| 10 | -- | 05/09/2019 | 05/09/2019 | MID – TERM BREAK | | | | | Academically Off |
| 10 | -- | 06/09/2019 | 06/09/2019 | MID – TERM BREAK | | | | | Academically Off |
| 11 | 33 | 09/09/2019 | | Common base (CB) BJT configuration, derivation for the input resistance, output resistance, voltage gain, current gain & the numerical examples on CB – BJT configuration | ELX 302.3 | PO-1 & PO-2 | | Chalk, duster & black-board | Syllabus for UT – 2 |
| 11 | -- | 10/09/2019 | | HOLIDAY ON ACCOUNT OF MUHARRAM | | | | | Academically Off |
| 11 | 34 | 12/09/2019 | | Common emitter (CE) BJT configuration, derivation for input resistance, output resistance, voltage gain, current gain & the numerical examples on CE – BJT configuration | ELX 302.3 | PO-1 & PO-2 | Experiment No. 8 | Chalk, duster & black-board | Syllabus for UT – 2 |
| 11 | 35 | 13/09/2019 | | Common collector (CC) BJT configuration, derivation for input resistance, output resistance, voltage gain, current gain & the numerical examples on CC – BJT configuration | ELX 302.3 | PO-1 & PO-2 | Assignment No. 2 | Chalk, duster & black-board | Syllabus for UT – 2 |

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| 12 | 36 | 16/09/2019 | | Junction field effect transistor (JFET) – construction, theory of operation / working, device symbols & configurations, voltage & current flow, V-I characteristics | ELX 302.1 | PO-1 | Experiment No. 5 | PPT | YouTube Video |
| 12 | 37 | 17/09/2019 | | Fixed / gate biasing circuit, theory of working / operation, its advantages & disadvantages, numerical analysis, graphical analysis & designing steps | ELX 302.3 | PO-1 & PO-2 | | Chalk, duster & black-board | |
| 12 | 38 | 19/09/2019 | | Self biasing circuit, theory of working / operation, advantages & disadvantages, numerical analysis, graphical analysis & designing steps | ELX 302.3 | PO-1 & PO-2 | Experiment No. 6 | Chalk, duster & black-board | |
| 12 | 39 | 20/09/2019 | | Voltage divider biasing circuit, theory of working / operation, its advantages & disadvantages, numerical analysis, graphical analysis & designing steps | ELX 302.3 | PO-1 & PO-2 | Experiment No. 6 | Chalk, duster & black-board | |
| 13 | 40 | 23/09/2019 | | AC load line in JFET, small signal (AC) models (black box small signal model), graphical analysis & the AC equivalent circuit for JFET based amplifiers | ELX 302.1 | PO-1 | | Chalk, duster & black-board | |
| 13 | 41 | 24/09/2019 | | Common gate (CG) JFET configuration, derivation for the input resistance, output resistance, voltage gain, current gain & the numerical examples on CG – JFET configuration | ELX 302.3 | PO-2 | | Chalk, duster & black-board | Syllabus for UT – 2 |
| 13 | 42 | 26/09/2019 | | Common source (CS) JFET configuration, derivation for the input resistance, output resistance, voltage gain, current gain & the numerical examples on CS – JFET configuration | ELX 302.3 | PO-2 | Experiment No. 9 | Chalk, duster & black-board | Syllabus for UT – 2 |
| 13 | 43 | 27/09/2019 | | Common drain (CD) JFET configuration, derivation for the input resistance, output resistance, voltage gain, current gain & the numerical examples on CD – JFET configuration | ELX 302.3 | PO-2 | Assignment No. 3 | Chalk, duster & black-board | Syllabus for UT – 2 |
| 14 | 44 | 30/09/2019 | | Metal oxide semiconductor field effect transistor (MOSFET) construction, theory of operation / working, device symbols & configurations, voltage & current flow, V-I characteristics | ELX 302.1 & ELX 302.2 | PO-1 & PO-2 | | Chalk, duster & black-board | |
| 14 | 45 | 01/10/2019 | | Depletion type (D-type) MOSFET construction, characteristics & theory of operation / working, symbols, its advantages & its disadvantages, biasing circuits | ELX 302.1 | PO-1 & PO-2 | | PPT | YouTube Video |

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| 14 | 46 | 03/10/2019 | | Enhancement type (E-type) MOSFET construction, the V-I characteristics & theory of operation / working, symbols, its advantages & its disadvantages, biasing circuits | ELX 302.1 | PO-1 & PO-2 | | PPT | YouTube Video |
| 14 | 47 | 04/10/2019 | | Schottkey diode – construction, symbol, theory of operation & working, V-I characteristics, practical applications, advantage & disadvantages | ELX 302.5 | PO-9, PO-11 & PO-12 | Student Seminar | PPT | |
| 15 | 48 | 07/10/2019 | | Tunnel diode – construction, symbol, theory of operation & working, V-I characteristics, practical applications, advantages & disadvantages | ELX 302.5 | PO-9, PO-11 & PO-12 | Student Seminar | PPT | |
| 15 | -- | 08/10/2019 | 08/10/2019 | HOLIDAY ON ACCOUNT OF DASSERRA | | | | | Academically Off |
| 15 | 49 | 10/10/2019 | | Varactor diode – construction, symbol, theory of operation & working, V-I characteristics, practical applications, advantages & disadvantages | ELX 302.5 | PO-9, PO-11 & PO-12 | Student Seminar | PPT | |
| 15 | 50 | 11/10/2019 | | Photo-diodes, photo-transistors, light emitting diode (LED) & solar cells – constructions, symbols, theory of operation & working, V-I characteristics, practical applications | ELX 302.5 | PO-9, PO-11 & PO-12 | Student Seminar | PPT | |

List of Reference & Text Books :-

1. Donald A. Neamen – Electronic Circuit Analysis & Design, 2nd edition by Tata McGraw Hill.
2. David A. Bell – Electronic Devices & Circuits, 5th edition by Oxford Publishing.
3. S. Salivahanan & N. Suresh Kumar – Electronic Devices & Circuits, 3rd edition by Tata McGraw Hill.
4. Muhammad Rashid – Microelectronics Circuits Analysis & Design, 2nd edition by Cengage Learning.
5. Jacob Millman & Arvin Grabel – Microelectronics, 2nd edition by Tata McGraw Hill.
6. Millman & Halkias – Electronic Devices & Circuits, 2nd edition by McGraw Hill.
7. Boylestad & Nashelsky – Electronic Devices & Circuit Theory, 3rd edition by Tata McGraw Hill.
8. R. S. Sedha – Textbook of Applied Electronics, 4th edition by S. Chand Publishing Co. Ltd.

Internal Assessment (IA) :-

Two tests must be conducted which should cover at least 80% of syllabus. The average marks of both the tests will be considered as final IA marks.

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End Semester Examination :-

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. Total 4 questions need to be solved.
3. Question No.1 will be compulsory and based on entire syllabus wherein sub questions of 2 to 5 marks will be asked.
4. Remaining questions will be selected from all the modules

Submission & Approval :-

| SUBMITTED BY :- | APPROVED BY :- |
|---|--|
| Prof. Jayen Modi | (i) Prof. K. Narayanan Sign :- |
| Sign: | (ii) Dr. Sapna Prabhu Sign :- |
| | (iii) Prof. Shilpa Patil Sign :- |
| | (iv) Prof. Monica Khanore Sign :- |
| | |
| Date of Submission :- 15 th July 2019 | Date of Approval :- |
| Remarks by PAC (if any) :- | |
| | |