



Kalasalingam Academy of Research and Education
 (Deemed to be University)
 Under Sec. 3 of UGC Act 1956
 Anand Nagar, Krishnankoil (Via)
 Virudhunagar (Dt), Tamil Nadu, India – 626 126

ECE101 SAMPLE COURSE

ECE101 Sample Course	L	T	P	X	C
	3	0	2	0	4
Pre-requisite: Course Code of Sample Pre-requisite Course Code of Sample Pre-requisite	Course Category / Type: PM/TC				

Course Description

This course introduces fundamental circuit analysis methods for linear networks.

Course Objectives

- Develop the ability to model simple electrical networks using ideal elements.
- Apply systematic methods to solve DC and AC linear circuits.
- Interpret circuit behaviour using standard engineering metrics.
- Develop the ability to model simple electrical networks using ideal elements.
- Apply systematic methods to solve DC and AC linear circuits.
- Interpret circuit behaviour using standard engineering metrics.

Course Outcomes

CO1: Analyse linear circuits using nodal and mesh methods.

CO2: Determine steady-state AC responses using phasor techniques.

CO3: Evaluate power in AC circuits using appropriate quantities.

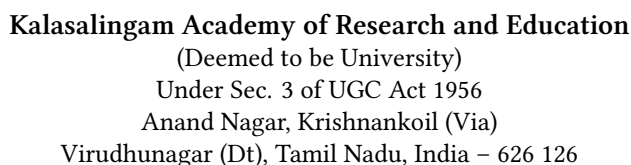
Articulation Matrix CO to PO, PSO

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	1	1	-	-	-	-	-	-	-	2	1	1
CO2	2	3	2	1	-	-	-	2	1	1	-	-	-	-
CO3	1	2	3	2	1	-	-	-	-	-	2	1	1	-

Articulation Matrix CO to SO, PSO

CO	SO							PSO		
	1	2	3	4	5	6	7	1	2	3
CO1	3	2	1	1	-	-	-	2	1	1
CO2	2	3	2	1	-	2	1	1	-	-
CO3	1	2	3	2	1	-	-	1	1	-

Course Topics

[illegible]



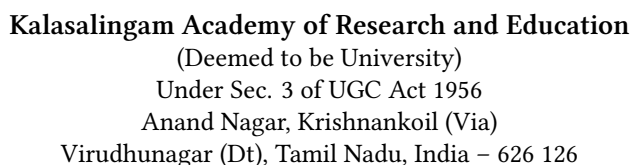
Kalasalingam Academy of Research and Education
(Deemed to be University)
Under Sec. 3 of UGC Act 1956
Anand Nagar, Krishnankoil (Via)
Virudhunagar (Dt), Tamil Nadu, India – 626 126

	<p>Theory:</p> <ul style="list-style-type: none"> • PN junction and biasing <ul style="list-style-type: none"> – PN junction formation, equilibrium, depletion region – Forward and reverse bias characteristics • Diode characteristics and models <ul style="list-style-type: none"> – Diode I–V equation – Temperature effects on diode behaviour – Junction capacitances – Spice modelling of diodes, diode small signal model • Breakdown mechanisms and special diodes <ul style="list-style-type: none"> – Breakdown mechanisms: Zener, avalanche – Zener and Schottky diode basics • Optoelectronic diodes <ul style="list-style-type: none"> – Photodiode operation, responsivity, dark current – LED operation – Solar cell: photocurrent, open-circuit voltage • Diode datasheets <ul style="list-style-type: none"> – Interpretation of diode datasheets <p>Practical:</p> <ul style="list-style-type: none"> • PN Junction and Zener Diode I–V Characteristics <ul style="list-style-type: none"> – Design a safe experimental setup to measure forward and reverse I–V characteristics within datasheet limits. – Record and plot I–V characteristics to identify key operating regions. – Compare experimentally obtained parameters with datasheet specifications. • LED and Photodiode I–V Characteristics under Illumination <ul style="list-style-type: none"> – Measure I–V characteristics of LEDs and photodiodes under controlled illumination. – Select appropriate sensing resistance and analyse wavelength-dependent response. – Interpret results using responsivity and wavelength data from datasheets. 	9	
		6	
3	Diode Circuits and Applications		CO3



Kalasalingam Academy of Research and Education
(Deemed to be University)
Under Sec. 3 of UGC Act 1956
Anand Nagar, Krishnankoil (Via)
Virudhunagar (Dt), Tamil Nadu, India – 626 126

	<p>Theory:</p> <ul style="list-style-type: none"> • Rectifiers and ripple <ul style="list-style-type: none"> – Half-wave, full-wave, and bridge rectifiers – Ripple factor • Filter circuits <ul style="list-style-type: none"> – Filter circuits (capacitor filter, RC basics) • Wave shaping circuits <ul style="list-style-type: none"> – Clippers and clampers – Voltage multiplier • Zener diode applications <ul style="list-style-type: none"> – Zener diode as voltage limiter/regulator • Load-line and component considerations <ul style="list-style-type: none"> – Load-line analysis of Diodes – Component tolerances and derating fundamentals <p>Practical:</p> <ul style="list-style-type: none"> • Rectifier with Filter Design to Achieve Given Ripple Specification <ul style="list-style-type: none"> – Design a rectifier and filter circuit to meet a specified ripple requirement. – Select component ratings based on voltage and current constraints. – Measure output waveform and ripple and validate against design targets. • Design of a Zener Voltage Regulator <ul style="list-style-type: none"> – Design a Zener regulator to maintain approximately constant output voltage. – Select series resistance based on load and Zener current requirements. – Evaluate regulation performance under varying load conditions. • Clipper and Clamper Circuit Realisation and Analysis <ul style="list-style-type: none"> – Design clipper and clamper circuits to achieve specified voltage limits. – Analyse circuit behaviour considering diode forward voltage. – Validate output waveforms using practical component parameters. 	9	
4	<p>Bipolar Junction Transistors (BJTs)</p> <p>Theory:</p> <ul style="list-style-type: none"> • BJT structure and operation <ul style="list-style-type: none"> – BJT structure: NPN and PNP – Carrier flow and transistor action • Operating regions and characteristics <ul style="list-style-type: none"> – Operating regions: cutoff, active, saturation – Large-signal output characteristics – Early effect • BJT parameters <ul style="list-style-type: none"> – Emitter efficiency, base transport factor • Switching behaviour <ul style="list-style-type: none"> – BJT switching characteristics: rise time, fall time, storage time 	9	CO4



1. Millman, J., and Halkias, C., *Integrated Electronics*, McGraw-Hill, 1972.
2. IEEE Std 315-1975, Graphic Symbols for Electrical and Electronics Diagrams.



Kalasalingam Academy of Research and Education
 (Deemed to be University)
 Under Sec. 3 of UGC Act 1956
 Anand Nagar, Krishnankoil (Via)
 Virudhunagar (Dt), Tamil Nadu, India – 626 126

ECE102 COURSE CODE OF SAMPLE NEW COURSES

ECE102 Course Code of Sample New Courses	L	T	P	X	C
	3	0	2	0	4
Pre-requisite: Course Code of Sample Pre-requisite	Course Category / Type: PE/TC				

Course Description

This course introduces fundamental circuit analysis methods for linear networks.

Course Objectives

- Develop the ability to model simple electrical networks using ideal elements.
- Apply systematic methods to solve DC and AC linear circuits.
- Interpret circuit behaviour using standard engineering metrics.

Course Outcomes

CO1: Analyse linear circuits using nodal and mesh methods.

CO2: Determine steady-state AC responses using phasor techniques.

CO3: Evaluate power in AC circuits using appropriate quantities.

Articulation Matrix CO to PO, PSO

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	1	1	-	-	2	1	1	-	-	-	-	-
CO2	2	3	2	1	-	-	-	-	2	1	1	-	-	-
CO3	1	2	3	2	1	2	1	1	-	-	-	-	-	-

Articulation Matrix CO to SO, PSO

CO	SO							PSO		
	1	2	3	4	5	6	7	1	2	3
CO1	3	2	1	1	-	-	-	2	1	1
CO2	2	3	2	1	-	2	1	1	-	-
CO3	1	2	3	2	1	-	-	1	1	-

Course Topics

Unit	Contents	Hrs.	COs
1	Semiconductor Physics		CO1



Kalasalingam Academy of Research and Education
(Deemed to be University)
Under Sec. 3 of UGC Act 1956
Anand Nagar, Krishnankoil (Via)
Virudhunagar (Dt), Tamil Nadu, India – 626 126

	<p>Theory:</p> <ul style="list-style-type: none"> • Energy band formation <ul style="list-style-type: none"> – E-k diagrams, Energy band formation: conductors, semiconductors, insulators • Intrinsic and extrinsic semiconductors <ul style="list-style-type: none"> – Intrinsic and extrinsic semiconductors, their energy bands • Doping, impurity ionization, Fermi level <ul style="list-style-type: none"> – Doping, impurity ionization, Fermi level • Carrier transport; carrier generation and recombination <ul style="list-style-type: none"> – Carrier transport: drift, mobility, diffusion – Carrier generation and recombination • Resistivity; sheet resistance; Poisson and continuity equations <ul style="list-style-type: none"> – Resistivity of doped semiconductors; sheet resistance fundamentals – Poisson and continuity equations <p>Practical:</p> <ul style="list-style-type: none"> • Simulation of Energy Band Models and Material Resistivity Trends <ul style="list-style-type: none"> – Define realistic semiconductor materials, doping concentrations, and temperature ranges using standard material parameters. – Compute and plot resistivity variation with doping concentration and temperature, ensuring physically meaningful results. – Illustrate qualitative energy band diagrams and analyse Fermi level shift with doping type and level. • Carrier Concentration vs Temperature Visualization <ul style="list-style-type: none"> – Compute carrier concentration variation with temperature for intrinsic and doped semiconductors. – Select doping concentrations to satisfy a target resistivity condition at room temperature. – Plot and analyse carrier concentration trends over a practical temperature range. 	9	
		6	
2	PN Junction and Diode Characteristics		CO2



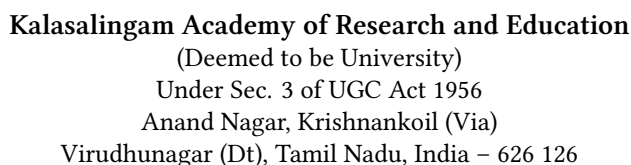
Kalasalingam Academy of Research and Education
(Deemed to be University)
Under Sec. 3 of UGC Act 1956
Anand Nagar, Krishnankoil (Via)
Virudhunagar (Dt), Tamil Nadu, India – 626 126

	<p>Theory:</p> <ul style="list-style-type: none"> • PN junction and biasing <ul style="list-style-type: none"> – PN junction formation, equilibrium, depletion region – Forward and reverse bias characteristics • Diode characteristics and models <ul style="list-style-type: none"> – Diode I–V equation – Temperature effects on diode behaviour – Junction capacitances – Spice modelling of diodes, diode small signal model • Breakdown mechanisms and special diodes <ul style="list-style-type: none"> – Breakdown mechanisms: Zener, avalanche – Zener and Schottky diode basics • Optoelectronic diodes <ul style="list-style-type: none"> – Photodiode operation, responsivity, dark current – LED operation – Solar cell: photocurrent, open-circuit voltage • Diode datasheets <ul style="list-style-type: none"> – Interpretation of diode datasheets <p>Practical:</p> <ul style="list-style-type: none"> • PN Junction and Zener Diode I–V Characteristics <ul style="list-style-type: none"> – Design a safe experimental setup to measure forward and reverse I–V characteristics within datasheet limits. – Record and plot I–V characteristics to identify key operating regions. – Compare experimentally obtained parameters with datasheet specifications. • LED and Photodiode I–V Characteristics under Illumination <ul style="list-style-type: none"> – Measure I–V characteristics of LEDs and photodiodes under controlled illumination. – Select appropriate sensing resistance and analyse wavelength-dependent response. – Interpret results using responsivity and wavelength data from datasheets. 	9	
		6	
3	Diode Circuits and Applications		CO3



Kalasalingam Academy of Research and Education
(Deemed to be University)
Under Sec. 3 of UGC Act 1956
Anand Nagar, Krishnankoil (Via)
Virudhunagar (Dt), Tamil Nadu, India – 626 126

	<p>Theory:</p> <ul style="list-style-type: none"> Rectifiers and ripple <ul style="list-style-type: none"> Half-wave, full-wave, and bridge rectifiers Ripple factor Filter circuits <ul style="list-style-type: none"> Filter circuits (capacitor filter, RC basics) Wave shaping circuits <ul style="list-style-type: none"> Clippers and clampers Voltage multiplier Zener diode applications <ul style="list-style-type: none"> Zener diode as voltage limiter/regulator Load-line and component considerations <ul style="list-style-type: none"> Load-line analysis of Diodes Component tolerances and derating fundamentals <p>Practical:</p> <ul style="list-style-type: none"> Rectifier with Filter Design to Achieve Given Ripple Specification <ul style="list-style-type: none"> Design a rectifier and filter circuit to meet a specified ripple requirement. Select component ratings based on voltage and current constraints. Measure output waveform and ripple and validate against design targets. Design of a Zener Voltage Regulator <ul style="list-style-type: none"> Design a Zener regulator to maintain approximately constant output voltage. Select series resistance based on load and Zener current requirements. Evaluate regulation performance under varying load conditions. Clipper and Clamper Circuit Realisation and Analysis <ul style="list-style-type: none"> Design clipper and clamper circuits to achieve specified voltage limits. Analyse circuit behaviour considering diode forward voltage. Validate output waveforms using practical component parameters. 	9	
		6	
4	<p>Bipolar Junction Transistors (BJTs)</p> <p>Theory:</p> <ul style="list-style-type: none"> BJT structure and operation <ul style="list-style-type: none"> BJT structure: NPN and PNP Carrier flow and transistor action Operating regions and characteristics <ul style="list-style-type: none"> Operating regions: cutoff, active, saturation Large-signal output characteristics Early effect BJT parameters <ul style="list-style-type: none"> Emitter efficiency, base transport factor Switching behaviour <ul style="list-style-type: none"> BJT switching characteristics: rise time, fall time, storage time 	9	CO4



Textbooks

- ## References

1. Millman, J., and Halkias, C., *Integrated Electronics*, McGraw-Hill, 1972.
2. IEEE Std 315-1975, Graphic Symbols for Electrical and Electronics Diagrams.