

Syllabus [2025Year 2 Term]

Course Information

Course Title	Digital Circuit Design	Credits	3
Course Code	514170-1	Required/Elective (For Undergraduate Courses)	Selective majors
Department or Major	Department of Mobile Systems Engineering	Language	English
Methods of Teaching		Lecture Room	월9,10,11,12,13,14(국제210)
Time Allotment	Lecture(3) Experiments(0) Trainging & Practice(0) Performance(0) Designing & Planning(0)	Cyber Lectures	
Course Type	offline		
Cyber Lectures Preview			

Lecturer

Lecturer	Name	JaeYeon Park	Rank	Assistant Professor	Final Academic Degree	공학박사
	Department & college	Department of Mobile Systems Engineering		Office		
	Office Phone Number	—		e-mail	jaeyeon.park@dankook.ac.kr	
	Field of Interest					

Course Summary

Course Description	This course introduces the fundamental principles and analytical techniques of electric circuits. Students will study how to mathematically model and analyze circuits composed of resistors, capacitors, inductors, voltage/current sources, and operational amplifiers. Emphasis is placed on theoretical and analytical understanding, including Ohm's Law, Kirchhoff's Laws, nodal and mesh analysis, Thevenin and Norton equivalents, transient response, sinusoidal steady-state analysis, frequency response, and Laplace and Fourier transforms. The course aims to develop a solid foundation for analyzing and understanding the operation of practical circuits through mathematical reasoning, without the use of simulation tools.
Description Related Courses	Digital Logic Design, Engineering Mathematics, Calculus

Course Goals	<p>[Knowledge Application] Students will be able to apply basic circuit laws and mathematical tools to analyze the behavior of various circuits in both time and frequency domains.</p> <p>[Creative Problem-Solving] Students will approach circuit problems with appropriate analytical methods and develop effective strategies to solve them based on given conditions.</p> <p>[Logical Thinking] Students will build step-by-step reasoning skills by combining mathematical analysis with physical intuition to logically interpret circuit behavior and outcomes.</p>
Projected Results	<p>Understand and explain the characteristics and behavior of basic circuit components.</p> <p>Apply nodal analysis, mesh analysis, and equivalent circuit techniques to analyze various circuits.</p> <p>Analyze the transient and steady-state responses of RC, RL, and RLC circuits.</p> <p>Perform AC circuit analysis using sinusoidal signals and phasor representations.</p> <p>Utilize Laplace and Fourier transforms to conduct circuit analysis in the s-domain and frequency domain.</p> <p>Theoretically analyze and predict the performance of applications such as filters and operational amplifier circuits.</p> <p>Approach complex circuit problems systematically and express solutions clearly and logically using mathematical and conceptual reasoning.</p>
Percentage of the original language classes(%)	
Cyber Lectures Preview	

Syllabus

Times	Lecture Topic	Lecture Goals	Lecture Methods	Assignments
1	Orientation & Basic Circuit Terminology	<ul style="list-style-type: none"> – Introduction to the history of electrical and electronic engineering – Concepts of charge, current, voltage, and power – Introduction to basic circuit elements (resistors, sources, etc.) 	강의,	
2	Resistive Circuits and Ohm's Law	<ul style="list-style-type: none"> – Definition of resistance and i-v characteristics – Series and parallel connections – Kirchhoff's Current and Voltage Laws (KCL, KVL) 	강의,	

Times	Lecture Topic	Lecture Goals	Lecture Methods	Assignments
3	Equivalent Circuits and Bridge Circuits	<ul style="list-style-type: none"> - Thevenin and Nort on equivalents - Y-Δ transformatio ns - Wheatstone bridg e and nonlinear ele ments 	강의,	
4	Circuit Analysis Techniques I	<ul style="list-style-type: none"> - Nodal analysis an d mesh analysis - Supernode and s upermesh concepts - Shortcut (intuitive) analysis methods 	강의,	
5	Circuit Analysis Techniques II	<ul style="list-style-type: none"> - Principle of super position - Review of Theveni n/Norton theorems - Maximum power tr ansfer, intro to BJT 	강의,	
6	Operational Amplifiers I	<ul style="list-style-type: none"> - Basic operation of op-amps - Inverting, non-inv erting amplifiers and voltage followers - Equivalent models and negative feedb ack 	강의,	
7	Operational Amplifiers II	<ul style="list-style-type: none"> - Applications: sum ming amplifiers, diff erential amplifiers, i nstrumentation amp s - Introduction to MO SFETs and applicati ons - Multisim simulatio n techniques 	강의,	
8	Midterm Exam			
9	RC and RL Circuits	<ul style="list-style-type: none"> - Characteristics of capacitors and indu ctors - Natural and step r esponses of RC/RL circuits - Op-amp-based re sponse circuits 	강의,	
10	RLC Circuits and Response An alysis	<ul style="list-style-type: none"> - Series/parallel RL C circuit responses - Overdamped, und erdamped, critically damped cases - General solutions 	강의,	

Times	Lecture Topic	Lecture Goals	Lecture Methods	Assignments
		and initial conditions		
11	AC Analysis I	<ul style="list-style-type: none"> – Sinusoidal signals and phasors – Impedance and phasor-domain analysis – Y-Δ conversions and impedance transformations 	강의,	
12	AC Analysis II & Power	<ul style="list-style-type: none"> – Phasor diagrams – Average and complex power, power factor correction – Introduction to power supply circuits 	강의,	
13	Frequency Response and Filters	<ul style="list-style-type: none"> – Transfer functions and Bode plots – Passive and active filters – Cascade design and modulation applications 	강의,	
14	Laplace & Fourier Analysis	<ul style="list-style-type: none"> – Laplace transform properties and circuit applications – Fourier series and transforms – Spectrum analysis and image restoration 	강의,	
15	Final Exam			

Methods of Grading

sequence	Description	Percentage	Details
1	Mid-term Exam	30%	
2	Final-exam	35%	
3	Pop Quizzes	0%	
4	Assignments	20%	
5	Reports	0%	
6	Presentations & Discussions	0%	
7	Attendance	15%	
8		0%	
All		100%	

sequence	Description	Percentage	Details
9	Others	0%	
All		100%	

Core of Value

핵심가치	전공역량	역량정의	역량구분	값(%)
혁신 (Discovery)	창의적문제해결 (Creative problem-solving)	주어진 상황과 문제를 창의적으로 해결할 수 있는 능력	부역량	20%
혁신 (Discovery)	도전 (Challenging)	전공 지식을 새로운 분야와 융합하고 아우를 수 있는 능력		0%
혁신 (Discovery)	지식융합 (Knowledge convergence)	새로운 분야를 개척하거나 도전적으로 임할 수 있는 능력		0%
헌신 (Dedication)	세계시민 (Universal value)	세계 공동체 구성원으로 전공자로서 국제적 이슈에 대응할 수 있는 능력		0%
헌신 (Dedication)	상호협력 (Cooperation)	공동의 목적 달성을 위해 타인과 상호협력을 할 수 있는 능력		0%
헌신 (Dedication)	공동체 (Sense of community)	공동체의 구성원으로서 필요한 태도와 윤리의식을 가질 수 있는 능력		0%
능동 (self-Determination)	자기주도 (Self-Managing)	주어진 상황과 문제를 주도적이고 능동적으로 해결할 수 있는 능력		0%
능동 (self-Determination)	지식활용 (Knowledge application)	주어진 상황과 문제에 대해 논리적으로 파악하고 분석할 수 있는 능력	부역량	30%
능동 (self-Determination)	논리적사고 (Logical thinking)	전공관련 지식을 필요에 따라 다양하게 적용하고 활용할 수 있는 능력	주역량	50%
능동 (self-Determination)	의사소통 (Articulation)	대화를 통해 다양한 의견을 조율하고 합의를 이끌어 낼 수 있는 능력		0%

Textbook(s) & References

Descrip tion	Title	Author	Publisher
Requi red T extbo ok	Circuits	Circuit F awwaz T. Ulaby , Mich	NTS PRESS

Memo