GANPAT UNIVERSITY									
FACULTY OF ENGINEERING & TECHNOLOGY									
Programme	Master of Technology					Branch/Spec.	Electronics and Communication Engineering – Embedded Systems		
Semester	I					Version	1.0.0.0		
Effective from Academic Year	2026-27					Effective for the Batch admitted in	July 2026		
Course Code	3ES1102		Course Name			Linux C Programming			
Teaching Scheme						Examination Scheme (Marks)			
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	1	-	4	Theory	50	50	100
Hours	3	0	2	-	5	Practical	25	25	50

Pre-requisites

Basic knowledge of Digital Electronics, Microprocessors & Microcontrollers, Computer Organization, and C Programming.

Course Outcomes

On successful completion of the course, the students will be able to:

CO1	To familiarize students with the Linux development environment, essential commands, and build tools.
CO2	To provide strong programming skills in C under Linux, including system calls and file handling.
CO3	To introduce process and thread management concepts for concurrent programming.
CO4	To develop competence in Inter-Process Communication (IPC) mechanisms.

Theory Syllabus

Unit	Content	Hrs.
1	**Linux Fundamentals & Development Environment** Introduction to Linux OS architecture, kernel vs shell; Linux file system hierarchy; essential Linux commands (file handling, permissions, process monitoring, networking, text processing — grep, awk, sed); shell scripting basics; text editors (vi/vim, nano); package management; introduction to GCC toolchain (compiling, linking, static/dynamic libraries).	07
2	**C Programming Under Linux:** Review of C fundamentals in Linux context; Linux system calls vs library functions; file I/O (open, read, write, close, lseek); file descriptors vs FILE pointers; error handling with errno; command-line arguments and environment variables; memory management (malloc/free, memory leaks, valgrind basics)	08
3	**Process Management & Multiprocessing:** Process concepts, PCB, process states; process creation using fork (), exec () family, wait ()/waitpid (); zombie and orphan processes; process termination and exit status; process scheduling basics in Linux; introduction to daemons.	08
4	**Multithreading & Inter-Process Communication (IPC):** POSIX threads (pthreads) – creation, joining, detaching; thread attributes; race conditions and critical sections; mutexes, semaphores, condition variables; deadlocks and avoidance strategies; thread-safe programming; comparison of multiprocessing vs multithreading in embedded contexts. Pipes and named pipes (FIFOs); message queues; shared memory; semaphores (System V and POSIX); signals and signal handling; sockets basics for local IPC; comparison and use-case selection of IPC mechanisms.	14
5	**Build Systems – Makefile & CMake:** Need for build automation; Makefile syntax, rules, targets, dependencies, variables, pattern rules; multi-file project builds; introduction to CMake — CMakeLists.txt structure, configuring, generating, and building projects; CMake vs Makefile; cross-compilation basics for embedded targets; integrating third-party libraries	8

Practical Content

Practical, assignments and tutorials are based on above syllabus.

Text Books

1	Michael Kerrisk, The Linux Programming Interface, No Starch Press — the most comprehensive single reference; covers Units II, III, and V in depth (file I/O, process management, and IPC — pipes, message queues, shared memory, signals).

Reference Books	
1	Robert Love, Linux System Programming, 2nd Edition, O'Reilly — best suited for Units I and IV; strong coverage of the Linux development environment/toolchain and a dedicated, well-regarded chapter on multithreading and pthreads.
2	W. Richard Stevens & Stephen A. Rago, Advanced Programming in the UNIX Environment, Addison-Wesley — classic industry-standard text, useful across Units II–V as a secondary reference, with strong case-study-driven coverage of processes, threads, and IPC.
ICT/MOOCs Reference	
1	https://www.youtube.com/watch?v=ZtqBQ68cfJc
2	https://www.youtube.com/watch?v=IVquJh3DXUA

Mapping of CO with PO and PSO :															
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	3	1	1	1	1	1	1	2	3	2	2
CO2	3	3	3	2	3	1	1	1	2	1	1	2	3	3	2
CO3	3	3	2	2	3	1	1	1	3	2	1	2	3	3	3
CO4	3	3	3	2	3	1	1	1	3	2	1	2	3	3	3