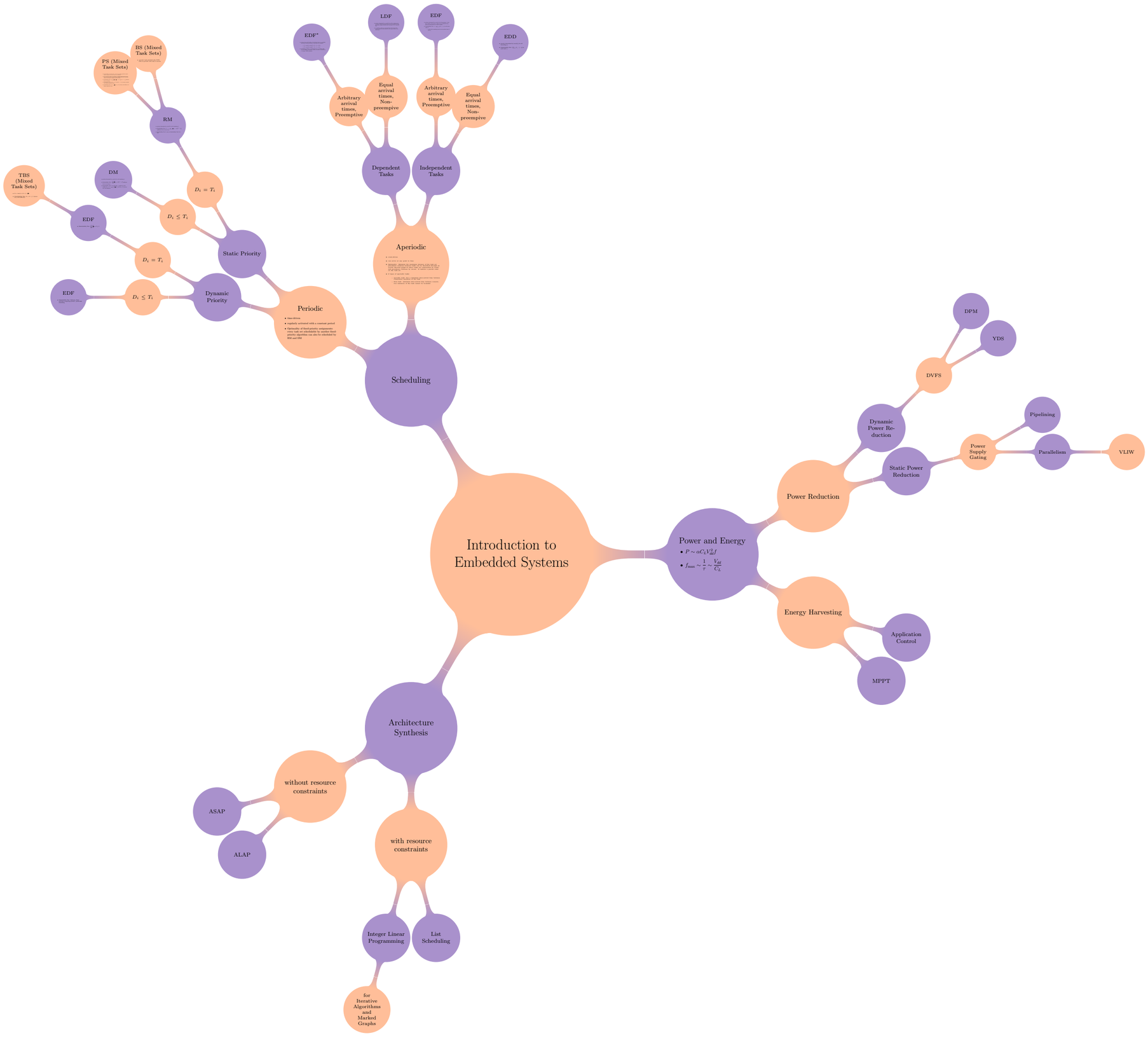
Introduction to Embedded Systems
Scheduling
Periodic
• time-driven
• regularly activated with a constant period
• Optimality of fixed-priority assignments: every task set schedulable by another fixed-priority algorithm can also be scheduled by RM and DM
Static Priority
$D_i = T_i$
RM
PS (Mixed Task Sets)
BS (Mixed Task Sets)
$D_i \leq T_i$
DM
Dynamic Priority
$D_i = T_i$
EDF
TBS (Mixed Task Sets)
$D_i \leq T_i$
EDF
Aperiodic
• event-driven
• can occur at any time in time
• Sporadic: sporadic tasks are aperiodic tasks with a minimum inter-arrival time T_i and a deadline D_i that is equal to the minimum inter-arrival time T_i
• Types of Aperiodic tasks:
Hard: hard, soft, firm, aperiodic processor time, bandwidth preserving, slack stealing
Soft: deadline miss-ratio, response time, bandwidth preserving, slack stealing, deadline miss-ratio of the task cannot be scheduled
Independent Tasks
Dependent Tasks
Equal arrival times, Non-preemptive
EDD
Arbitrary arrival times, Preemptive
EDF
Equal arrival times, Non-preemptive
Arbitrary arrival times, Preemptive
LDF
EDF*
Power and Energy
• $P \sim aC_L V_{dd}^2 f$
• $f_{max} \sim \frac{1}{\tau} \sim \frac{V_{dd}}{C_L}$
Power Reduction
Dynamic Power Reduction
DVFS
DPM
YDS
Static Power Reduction
Power Supply Gating
Pipelining
Parallelism
VLIW
Energy Harvesting
Application Control
MPPT
Architecture Synthesis
without resource constraints
ASAP
ALAP
with resource constraints
Integer Linear Programming
List Scheduling
for Iterative Algorithms and Marked Graphs