Module 7
Section A: Planning Detailed Schedules

Term
Back scheduling

Module 7
Section A: Planning Detailed Schedules

Term
Batch processing

Module 7
Section A: Planning Detailed Schedules

Term
Block scheduling

Module 7
Section A: Planning Detailed Schedules

Term
Capacity cushion

Module 7
Section A: Planning Detailed Schedules

Term
Capacity requirements

Module 7
Section A: Planning Detailed Schedules

Term
Capacity utilization

Module 7
Section A: Planning Detailed Schedules

Term
Central point scheduling

Module 7
Section A: Planning Detailed Schedules

Term
Continuous process control

1) A manufacturing technique in which parts are accumulated and processed together in a lot. 2) A computer technique in which transactions are accumulated and processed together or in a lot. Syn.: batch production.

A technique for calculating operation start dates and due dates. The schedule is computed starting with the due date for the order and working backward to determine the required start date and/or due dates for each operation. Syn.: backward scheduling. Ant.: forward scheduling.

Extra capacity that is added to a system after capacity for expected demand is calculated. Syn.: safety capacity. See: protective capacity.

An operation-scheduling technique in which each operation is allowed a block of time, such as a day or a week.

Goods produced, or customers served, divided by total output capacity.

The resources needed to produce the projected level of work required from a facility over a time horizon. Capacity requirements are usually expressed in terms of hours of work or, when units consume similar resources at the same rate, units of production.

The use of sensors to monitor a process and make automatic changes in operations through the design of appropriate feedback control loops. Devices used may be mechanical, electromechanical, or computerized.

A variant of scheduling that employs both forward and backward scheduling, starting from the scheduled start date of a particular operation.

Module 7
Section A: Planning Detailed Schedules

Term
Control board

Module 7
Section A: Planning Detailed Schedules

Term
Critical ratio

Module 7
Section A: Planning Detailed Schedules

Term
Dispatch list

Module 7
Section A: Planning Detailed Schedules

Term
Dispatching

Module 7
Section A: Planning Detailed Schedules

Term
Dispatching rule

Module 7
Section A: Planning Detailed Schedules

Term
External setup time

Module 7
Section A: Planning Detailed Schedules

Term
Finite forward scheduling

Module 7
Section A: Planning Detailed Schedules

Term
Finite loading

A dispatching rule that calculates a priority index number by dividing the time to due date remaining (time remaining) by the expected elapsed time to finish the job (work remaining). For example, critical ratio = time remaining / work remaining = 30 / 40 = .75. A ratio less than 1.0 indicates the job is behind schedule, a ratio greater than 1.0 indicates the job is ahead of schedule, and a ratio of 1.0 indicates the job is on schedule.

A visual means of showing machine loading or project planning, usually a variation of the basic Gantt chart. Syns.: planning board, schedule board. See: dispatch board, schedule chart.

1) Selecting and sequencing available jobs to be run at individual workstations and assigning those jobs to workers. 2) Planning and controlling the movement of goods to satisfy customer requirements, including assigning shipments to specific vehicles and drivers and monitoring the status of shipments in transit.

A list of manufacturing orders in priority sequence containing detailed information about priority, location, quantity, and the capacity requirements of the manufacturing order by operation. Dispatch lists are normally generated daily and oriented by work center. Syns.: priority report, work center schedule.

The time associated with elements of a setup procedure performed while the process or machine is running. Ant.: internal setup time.

The logic used to assign priorities to jobs at a work center. See: job sequencing rule, longest-task-time (LTT) rule.

Assigning no more work to a work center than the work center can be expected to execute in a given time period. The term usually refers to a technique that involves calculating shop priority revisions in order to level load operation by operation. Syn.: finite scheduling. See: drum-buffer-rope (DBR).

A scheduling technique that builds a schedule by proceeding sequentially from the initial period to the final period while observing capacity limits. A Gantt chart may be used with this technique. See: finite loading.

Module 7
Section A: Planning Detailed Schedules

Term
Flow rate

Module 7
Section A: Planning Detailed Schedules

Term
Forward scheduling

Module 7
Section A: Planning Detailed Schedules

Term
Infinite loading

Module 7
Section A: Planning Detailed Schedules

Term
Internal setup time

Module 7
Section A: Planning Detailed Schedules

Term
Job sequencing rule

Module 7
Section A: Planning Detailed Schedules

Term
Job shop scheduling

Module 7
Section A: Planning Detailed Schedules

Term
Job status

Module 7
Section A: Planning Detailed Schedules

Term
Lead time

A scheduling technique in which the scheduler proceeds from a known start date and computes the completion date for an order, usually proceeding from the first operation to the last. Dates generated by this technique are generally the earliest start dates for operations. See: forward pass. Ant.: back scheduling.

The running rate of work through the manufacturing process which is measured as the inverse of cycle time. For example, if the cycle time is two minutes per unit, the flow rate is 240 units per eight-hour shift.

The time associated with elements of a setup procedure performed while the process or machine is not running. Ant.: external setup time.

Calculation of the capacity required at work centers in the time periods required regardless of the capacity available to perform this work. Syn.: infinite scheduling.

The manufacturing planning and control techniques used to sequence and prioritize production quantities across operations in a job shop.

A set of priorities and conditions that specify the order in which jobs are processed to meet objectives such as reducing idle time or minimizing lateness. See: dispatching rule.

1) A span of time required to perform a process (or series of operations). 2) In a logistics context, the time between recognition of the need for an order and the receipt of goods. Individual components of lead time can include order preparation time, queue time, processing time, move or transportation time, and receiving and inspection time. Syn.: total lead time. See: manufacturing lead time, purchasing lead time.

A periodic report showing the plan for completing a job (usually the requirements and completion date) and the progress of the job against that plan.

Module 7
Section A: Planning Detailed Schedules

Term
Limiting operation

Module 7
Section A: Planning Detailed Schedules

Term
Machine hours

Module 7
Section A: Planning Detailed Schedules

Term
Move time

Module 7
Section A: Planning Detailed Schedules

Term
Operation due date

Module 7
Section A: Planning Detailed Schedules

Term
Operation overlapping

Module 7
Section A: Planning Detailed Schedules

Term
Operation setback chart

Module 7
Section A: Planning Detailed Schedules

Term
Operation start date

Module 7
Section A: Planning Detailed Schedules

Term
Operation time

The amount of time, in hours, that a machine is actually running. Machine hours, rather than labor hours, may be used for planning capacity for scheduling and for allocating costs.

The operation with the least capacity in a series of operations with no alternative routings. The capacity of the total system can be no greater than the limiting operation, and as long as this limiting condition exists, the total system can be effectively scheduled by scheduling the limiting operation and providing this operation with proper buffers. See: bottleneck, protective capacity, protective inventory.

1) The date when an operation should be completed so that its order due date can be met. It can be calculated based on scheduled quantities and lead times. 2) A job sequencing algorithm (dispatching rule) giving earlier operation due dates higher priority.

The time that a job spends in transit from one operation to another in the plant.

A graphical display of the bill of material (BOM) and lead-time information provided by the routing for each part. The horizontal axis provides the lead time from raw materials purchase to component manufacture to assembly of the finished product.

The development of a manufacturing schedule that overlaps successive operations. Overlapping occurs when the completed portion of an order at one work center is processed at one or more succeeding work centers before the pieces left behind are finished at the preceding work centers. Syns.: lap phasing, overlapped schedule, telescoping. See: send ahead. Ant.: gapped schedule.

The total of setup and run time for a specific task. Syn.: operation duration.

The date when an operation should be started so that its order due date can be met. It can be calculated based on scheduled quantities and lead times or on the work remaining and the time remaining to complete the job.

Module 7
Section A: Planning Detailed Schedules

Term
Operations sequencing

Module 7
Section A: Planning Detailed Schedules

Term
Order priority

Module 7
Section A: Planning Detailed Schedules

Term
Primary work center

Module 7
Section A: Planning Detailed Schedules

Term
Priority control

Module 7
Section A: Planning Detailed Schedules

Term
Process batch

Module 7
Section A: Planning Detailed Schedules

Term
Production activity control (PAC)

Module 7
Section A: Planning Detailed Schedules

Term
Production rate

Module 7
Section A: Planning Detailed Schedules

Term
Production schedule

The level of importance given to each order with respect to its characteristics such as urgency, value, customer, and shipping distance. Order priority determines which orders should be manufactured or fulfilled first to maximize customer satisfaction and profitability.

A technique for short-term planning of actual jobs to be run in each work center based upon capacity (i.e., existing workforce and machine availability) and priorities. The result is a set of projected completion times for the operations and simulated queue levels for facilities.

The process of communicating start and completion dates to manufacturing departments in order to execute a plan. The dispatch list is the tool normally used to provide these dates and priorities based on the current plan and status of all open orders.

The work center where an operation on a manufactured part is normally scheduled to be performed. Ant.: alternate work center.

The function of routing and dispatching the work to be accomplished through the production facility and of performing supplier control. PAC encompasses the principles, approaches, and techniques needed to schedule, control, measure, and evaluate the effectiveness of production operations. See: shop floor control.

The quantity or volume of output that is to be completed at a workstation before switching to a different type of work or changing an equipment setup.

A plan that authorizes the factory to manufacture a certain quantity of a specific item. It is usually initiated by the production planning department.

The rate of production usually expressed in units, cases, or some other broad measure, expressed by a period of time (e.g., per hour, shift, day, or week). Syn.: production level.

Module 7
Section A: Planning Detailed Schedules

Term
Queue

Module 7
Section A: Planning Detailed Schedules

Term
Queue management

Module 7
Section A: Planning Detailed Schedules

Term
Queue time

Module 7
Section A: Planning Detailed Schedules

Term
Run time

Module 7
Section A: Planning Detailed Schedules

Term
Safety capacity

Module 7
Section A: Planning Detailed Schedules

Term
Sequencing

Module 7
Section A: Planning Detailed Schedules

Term
Setup

Module 7
Section A: Planning Detailed Schedules

Term
Setup time

Tactics to deal with an excess number of items, such as products or customers, waiting in line for service.

A waiting line. In manufacturing, this refers to the jobs at a given work center waiting to be processed. As queues increase, so do average queue time and work in process (WIP) inventory.

The time required to process a piece or lot at a specific operation. Run time does not include setup time. Syn.: run standards.

The amount of time a job waits at a work center before setup or work is performed on the job. Queue time is one element of total manufacturing lead time. Increases in queue time result in direct increases to manufacturing lead time and work-in-process inventories.

Determining the order in which a manufacturing facility is to process a number of different jobs in order to achieve certain objectives.

In theory of constraints, the planned amount by which available capacity exceeds current productive capacity. This capacity provides protection from planned activities (such as resource contention), preventive maintenance, and unplanned activities (such as resource breakdown, poor quality, rework, or lateness). Safety capacity plus productive capacity plus excess capacity equals 100 percent of capacity. Syn.: capacity cushion. See: protective capacity.

The time required for a specific machine, resource, work center, process, or line to convert from the production of the last good piece of item A to the first good piece of item B. Syn.: setup lead time. See: single-minute exchange of die (SMED).

1) The work required to change a specific machine, resource, work center, or line from making the last good piece of item A to making the first good piece of item B. 2) The refitting of equipment to neutralize the effects of the last lot produced (e.g., teardown of the just-completed production or preparation of the equipment for production of the next scheduled item). Syns.: changeover, turnaround time.

Module 7
Section A: Planning Detailed Schedules

Term
Standard time

Module 7
Section A: Planning Detailed Schedules

Term
Throughput

Module 7
Section A: Planning Detailed Schedules

Term
Transit time

Module 7
Section A: Planning Detailed Schedules

Term
Visual management

Module 7
Section A: Planning Detailed Schedules

Term
Wait time

Module 7
Section B: Scheduling and PAC Methods

Term
Backflush

Module 7
Section B: Scheduling and PAC Methods

Term
Balancing operations

Module 7
Section B: Scheduling and PAC Methods

Term
Bottleneck

1) The rate at which the system generates goal units. Because throughput is a rate, it is always expressed for a given time period, such as per month, week, day, or even minute. If the goal units are money, throughput is an amount of money per time period. In that case, throughput is calculated as revenues received minus total variable costs and then divided by units of the chosen time period. 2) In warehousing, it represents the number of goods that are moving through the warehouse at any given moment.

The length of time that should be required to (1) set up a given machine or operation and (2) run one batch or one or more parts, assemblies, or end products through that operation. It is used in determining machine requirements and labor requirements. It assumes an average worker who follows prescribed methods and allows time for personal rest to overcome fatigue and unavoidable delays. It also is frequently used as a basis for incentive pay systems and as a basis of allocating overhead in cost accounting systems. Syn.: standard hours. See: standard.

A management system in which every metric that matters, standardized work, and improvement approaches are displayed on the shop floor and in the office.

A standard allowance that is assumed on any given order for the movement of items from one operation to the next. Syn.: travel time.

A method of inventory bookkeeping where the book (system) inventory of components is automatically reduced by the system after completion of activity on the component's upper-level parent item based on what should have been used as specified on the bill of material (BOM) and allocation records. Syns.: explode-to-deduct, post-deduct inventory transaction processing. See: mixed-mode or reverse-material issue, pre-deduct inventory transaction processing.

The time a job remains at a work center after an operation is completed until it is moved to the next operation. It is often expressed as a part of move time.

A facility, function, department, or resource whose capacity is less than the demand placed upon it. For example, a bottleneck machine or work center exists where jobs are processed at a slower rate than they are demanded. Syn.: bottleneck operation. See: limiting operation.

In repetitive production, matching actual output cycle times of all operations to the demand or use for parts as required by final assembly and, eventually, as required by the market. See: balance.

Module 7
Section B: Scheduling and PAC Methods

Term
Buffer

Module 7
Section B: Scheduling and PAC Methods

Term
Buffer management

Module 7
Section B: Scheduling and PAC Methods

Term
By-product

Module 7
Section B: Scheduling and PAC Methods

Term
Capacity-constrained resource (CCR)

Module 7
Section B: Scheduling and PAC Methods

Term
Co-product

Module 7
Section B: Scheduling and PAC Methods

Term
Constraint

Module 7
Section B: Scheduling and PAC Methods

Term
Constraints management

Module 7
Section B: Scheduling and PAC Methods

Term
Control point

In theory of constraints, a process in which all expediting in a shop is driven by what is scheduled to be in the buffers (constraint, shipping, and assembly buffers). By expediting this material into the buffers, the system helps avoid idleness at the constraint and missed customer due dates. In addition, the reasons items are missing from the buffer are identified, and the frequency of occurrence is used to prioritize improvement activities. See: green zone.

1) A quantity of materials awaiting further processing. It can refer to raw materials, semi-finished stores or hold points, or a work backlog that is purposely maintained behind a work center. 2) In theory of constraints, buffers can be time or material, and they support throughput and/or due date performance.

Any resource that, if its capacity is not carefully managed, is likely to become a constraint and compromise the throughput of the organization.

A material of value produced as a residual of or incidental to the production process. The ratio of by-product to primary product is usually predictable. By-products may be recycled, sold as is, or used for other purposes. See: co-product.

1) Any element or factor that prevents a system from achieving a higher level of performance with respect to its goal. Constraints can be physical, such as a machine center or a lack of material, but they can also be managerial, such as a policy or procedure. 2) One of a set of equations that cannot be violated in an optimization procedure.

A product that is usually manufactured together with or sequentially with another product because of product or process similarities. See: by-product.

In theory of constraints, a strategic location in the logical product structure for a product or family that simplifies the planning, scheduling, and control functions. Control points include gating operations, convergent points, divergent points, constraints, and shipping points. Detailed scheduling instructions are planned, implemented, and monitored at these locations, allowing materials to flow rapidly through the facility without detailed work center scheduling and control.

The practice of managing resources and organizations in accordance with theory of constraints principles. See: theory of constraints (TOC).

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Section B: Scheduling and PAC Methods

Term
Corrective action

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Term
Counting point

Module 7
Section B: Scheduling and PAC Methods

Term
Cycle time

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Section B: Scheduling and PAC Methods

Term
Delivery schedule

Module 7
Section B: Scheduling and PAC Methods

Term
Divergent point

Module 7
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Term
Drum

Module 7
Section B: Scheduling and PAC Methods

Term
Drum schedule

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Term
Drum-buffer-rope (DBR)

A point in a flow of material or sequence of operations at which parts, subassemblies, or assemblies are counted as being complete. Counting points may be designated at the ends of lines or upon removal from a work center, but most often they are designated as the points at which material transfers from one department to another. Syn.: pay point.

The implementation of solutions resulting in the reduction or elimination of an identified problem.

The required or agreed time or rate of delivery of goods or services purchased for a future period.

1) In industrial engineering, the time between the completion of two discrete units of production. For example, the cycle time of motors assembled at a rate of 120 per hour is 30 seconds. 2) In materials management, the length of time from when material enters a production facility until it exits. Syn.: throughput time.

In theory of constraints, the constraint is viewed as a drum, and non-constraints are like soldiers in an army who march in unison to the drumbeat. The resources in a plant should perform in unison with the drumbeat set by the constraint.

An operation in a production process in which a single material or component enters and, after processing, can then be routed to a number of different downstream operations.

The theory of constraints method for scheduling and managing operations that have an internal constraint or capacity-constrained resource.

The detailed production schedule for a resource that sets the pace for the entire system. The drum schedule must reconcile the customer requirements with the system's constraint(s).

Module 7
Section B: Scheduling and PAC Methods

Term
Earned hours

Module 7
Section B: Scheduling and PAC Methods

Term
Excess capacity

Module 7
Section B: Scheduling and PAC Methods

Term
Feedback

Module 7
Section B: Scheduling and PAC Methods

Term
Feeder workstation

Module 7
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Term
Flexible workforce

Module 7
Section B: Scheduling and PAC Methods

Term
Floor stock

Module 7
Section B: Scheduling and PAC Methods

Term
Flow control

Module 7
Section B: Scheduling and PAC Methods

Term
Flow shop

Capacity that is not scheduled to be consumed by production or that is in place to protect the creation of throughput. See: idle capacity.

The amount of standard hours assigned to a quantity produced in a certain time period in order to measure manufacturing productivity. Syn.: earned volume.

An area of manufacturing that feeds a subsequent work area.

The flow of information back to a system so that actual performance can be compared with planned performance.

An inventory of inexpensive production parts from which production workers can draw without requisitions. Syn.: bench stock, expensed stock.

A workforce whose members are cross-trained and are permitted to be assigned to various tasks.

A form of manufacturing organization in which machines and operators handle a standard, usually uninterrupted, material flow. The operators generally perform the same operations for each production run. A flow shop is often referred to as a mass production shop. The plant layout is designed to facilitate a product flow, where each product, though variable in specifications, uses the same flowpattern. Production is set at a given rate, and the products are generally manufactured in bulk. Some process industries (chemicals, oil, paint, etc.) are examples of flow shops. Syns.: flow line, flow manufacturing, flow plant. See: continuous manufacturing, job shop.

A specific production control system that is based primarily on setting production rates and feeding work into production to meet these planned rates and then monitoring and controlling production. See: shop floor control.

Module 7
Section B: Scheduling and PAC Methods

Term
Forward flow scheduling

Module 7
Section B: Scheduling and PAC Methods

Term
Heijunka

Module 7
Section B: Scheduling and PAC Methods

Term
Inbound stockpoint

Module 7
Section B: Scheduling and PAC Methods

Term
Input/output control (I/O control)

Module 7
Section B: Scheduling and PAC Methods

Term
Intermittent production

Module 7
Section B: Scheduling and PAC Methods

Term
Kanban

Module 7
Section B: Scheduling and PAC Methods

Term
Labor efficiency

Module 7
Section B: Scheduling and PAC Methods

Term
Lean production

In just-in-time (JIT) philosophy, an approach to level production throughout the supply chain to match the planned rate of end product sales. See: load leveling, mixed-model production, mixed-model scheduling.

A procedure for building process train schedules that starts with the first stage and proceeds sequentially through the process structure until the last stage is scheduled.

A technique for capacity control in which planned and actual inputs and planned and actual outputs of a work center are monitored. Actual input is compared with planned input to identify when work center output might vary from the plan because work is not available at the work center. Actual output is also compared with planned output to identify problems within the work center. Syn.: input/output analysis. See: capacity control, input control, output control.

A defined location next to the place of use on a production floor. Materials are brought to the stockpoint as needed and taken from it for immediate use. Inbound stockpoints are used with a pull system of material control.

A method of just-in-time (JIT) production that uses standard containers or lot sizes with a single card (or other signaling device) attached to each. It is a pull system in which work centers signal that they wish to withdraw parts from feeding operations or suppliers. The term is often used synonymously for the specific scheduling system developed and used by the Toyota Motor Corporation in Japan. See: move card, production card, synchronized production.

A form of manufacturing in which the jobs pass through the functional departments in lots, and each lot may have a different routing. See: job shop.

A philosophy of production that emphasizes the minimization of the amount of all the resources (including time) used in the various activities of the enterprise. It involves identifying and eliminating non-value-adding activities in design, production, supply chain management, and customer management. Lean producers employ teams of multiskilled workers at all levels of the organization and use highly flexible, increasingly automated machines to produce volumes of products in potentially enormous variety. Lean production contains a set of principles and practices to reduce costs through the relentless removal of waste and through the simplification of all manufacturing and support processes. Syns.: lean, lean manufacturing.

The average of worker efficiency for all direct workers in a department or facility. Syn.: worker efficiency.

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Section B: Scheduling and PAC Methods

Term
Level production method

Module 7
Section B: Scheduling and PAC Methods

Term
Line balancing

Module 7
Section B: Scheduling and PAC Methods

Term
Lot sizing

Module 7
Section B: Scheduling and PAC Methods

Term
Lower specification limit (LSL)

Module 7
Section B: Scheduling and PAC Methods

Term
Machine-limited capacity

Module 7
Section B: Scheduling and PAC Methods

Term
Material-dominated scheduling (MDS)

Module 7
Section B: Scheduling and PAC Methods

Term
Mixed-flow scheduling

Module 7
Section B: Scheduling and PAC Methods

Term
Mixed-model production

1) The balancing of the assignment of the tasks to workstations in a manner that minimizes the number of workstations and minimizes the total amount of idle time at all stations for a given output level. In balancing these tasks, the specified time requirement per unit of product for each task and its sequential relationship with the other tasks must be considered. See: uniform plant loading. 2) A technique for determining the product mix that can be run on an assembly line to provide a consistent flow of work through that assembly line at the planned line rate.

A production planning method that maintains a stable production rate while varying inventory levels to meet demand. Syns.: level strategy, production leveling. See: level schedule.

In statistical process control, charting the line that defines the minimum acceptable level of random output. See: tolerance limits.

The process of, or techniques used in, determining lot size. See: order policy.

A technique that schedules materials before processors (equipment or capacity) to facilitate the efficient use of materials. MDS can be used to schedule each stage in a process flow scheduling system. Material requirements planning (MRP) systems use MDS logic. See: processor-dominated scheduling.

A production environment where a specific machine limits throughput of the process. See: constraint, throughput.

A lean practice consisting of the production of several different models or varieties of a product in small batches on the same production line without changeovers. See: heijunka, mixed-model scheduling.

A procedure used in some process industries for building process train schedules that start at an initial stage and work toward the terminal process stages. This procedure is effective for scheduling when several bottleneck stages may exist. Detailed scheduling is done at each bottleneck stage.

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Section B: Scheduling and PAC Methods

Term
Mixed-model scheduling

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Section B: Scheduling and PAC Methods

Term
Move card

Module 7
Section B: Scheduling and PAC Methods

Term
Occurrence factor

Module 7
Section B: Scheduling and PAC Methods

Term
One-card kanban system

Module 7
Section B: Scheduling and PAC Methods

Term
One-piece flow

Module 7
Section B: Scheduling and PAC Methods

Term
Operation yield

Module 7
Section B: Scheduling and PAC Methods

Term
Order release

Module 7
Section B: Scheduling and PAC Methods

Term
Outbound stockpoint

A card or other signal indicating that a specific number of units of an item are required and authorized to be moved from a source to a point of use. Syn.: move signal. See: kanban.

A lean practice that develops production schedules supporting mixed-model production in which every model of every product is manufactured each day at a rate that matches its daily demand, reducing inventories and minimizing overproduction. See: heijunka, mixed-model production, right size frequency of production wheel.

A kanban system in which only a move card is used. Typically, the work centers are physically close, so no production card is required. In many cases, squares located between work centers are used as the kanban system. An empty square signals the supplying work center to produce a standard container of the item. Syn.: single-card kanban system. See: two-card kanban system.

Within the repair or remanufacturing environment, the occurrence factor is associated with how often a repair is required to bring the average part to a serviceable condition (some repair operations do not occur 100 percent of the time). The factor is expressed at the operation level in the routing. See: repair factor, replacement factor.

The ratio of usable output from a process, process stage, or operation to the input quantity, usually expressed as a percentage.

The technique of processing an item directly from one step to the next, one unit at a time. This approach reduces waste by shortening lead times and lines of communication, thus enabling quality problems to be identified more quickly. One-piece flow is closely associated with lean manufacturing and just-in-time (JIT) methodologies.

A designated location near the point of use on a plant floor to which material produced is taken until it is pulled to the next operation.

The activity of releasing materials to a production process to support a manufacturing order. See: planned order release.

Module 7
Section B: Scheduling and PAC Methods

Term
Overload

Module 7
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Term
Pacemaker

Module 7
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Term
Probable scheduling

Module 7
Section B: Scheduling and PAC Methods

Term
Process manufacturing

Module 7
Section B: Scheduling and PAC Methods

Term
Process train

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Section B: Scheduling and PAC Methods

Term
Processor-dominated scheduling

Module 7
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Term
Production card

Module 7
Section B: Scheduling and PAC Methods

Term
Production reporting

In lean, the resource that is scheduled based on the customer demand rate for the value stream. This resource performs an operation or process that governs the flow of materials along the value stream to maintain a smooth flow through the manufacturing plant. A larger buffer is maintained for the pacemaker than other resources so that it can maintain continuous operation. See: constraint, pacing process.

A condition in which the total hours of work outstanding at a work center exceed that work center's capacity.

Production that adds value by mixing, separating, forming, and/or performing chemical reactions. It may be done in either batch or continuous mode. See: project manufacturing.

A variant of scheduling that considers slack time to increase or decrease the calculated lead time of an order. Interoperation and administrative lead time components are expanded or compressed by a uniform stretching factor until no difference exists between the schedule of operations obtained by forward and backward scheduling. See: lead time scheduling.

A technique that schedules equipment (processor) before materials. This facilitates scheduling equipment in economic run lengths and the use of low-cost production sequences. Processor-dominated scheduling is used in some process industries. See: material-dominated scheduling (MDS).

A representation of the flow of materials through a process industry manufacturing system that shows equipment and inventories. Equipment that performs a basic manufacturing step, such as mixing or packaging, is called a process unit. Process units are combined into stages, and stages are combined into process trains. Inventories decouple the scheduling of sequential stages within a process train.

A process for providing feedback to the production schedule and allow for corrective action and maintenance of valid on-hand and on-order balances. It normally includes manufacturing order authorization, release, acceptance, operation start, delay reporting, move reporting, scrap and rework reporting, order close-out, and payroll interface. Syns.: manufacturing order reporting, shop order reporting.

In a just-in-time (JIT) context, a card or other signal for indicating that items should be made for use or that some items removed from pipeline stock should be replaced. See: kanban.

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Section B: Scheduling and PAC Methods

Term
Pull signal

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Term
Remedial maintenance

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Section B: Scheduling and PAC Methods

Term
Resource-limited scheduling

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Section B: Scheduling and PAC Methods

Term
Reverse flow scheduling

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Term
Rope

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Section B: Scheduling and PAC Methods

Term
Specification

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Section B: Scheduling and PAC Methods

Term
Split lot

Module 7
Section B: Scheduling and PAC Methods

Term
Standardized work

Unscheduled maintenance performed to return a product or process to a specified performance level after a failure or malfunction.

Any signal that indicates when to produce or transport items in a pull replenishment system. For example, in just-in-time (JIT) production control systems, a kanban card is used as the pull signal to replenish parts to the using operation. See: pull system.

A scheduling procedure used in some process industries for building process train schedules. The scheduling starts with the last stage and proceeds backward (countercurrent to the process flow) through the process structure.

The scheduling of activities so that predetermined resource availability pools are not exceeded. Activities are started as soon as resources are available (with respect to logical constraints), as required by the activity. When not enough of a resource exists to accommodate all activities scheduled on a given day, a priority decision is made. Project finish may be delayed, if necessary, to alter schedules constrained by resource usage.

A clear, complete, and accurate statement of the technical requirements of a material, an item, or a service and of the procedure to determine if the requirements are met.

One of the three devices required for proper management of operations. (The other two are drum and buffer.) The rope is the information flow from the drum to the front of the line (material release), which chokes the release of materials to match the flow through the constraint.

A work process that is always carried out exactly the same way, preferably using the current best-known way under which the output can be achieved.

A manufacturing order quantity that has been divided into two or more smaller quantities, usually after the order has been released. The quantities of a split lot may be worked on in parallel, or a portion of the original quantity may be sent ahead to a subsequent operation to be worked on while work on the remainder of the quantity is being completed at the current operation. The purpose of splitting a lot is to reduce the lead time of the order.

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Takt time

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Theory of constraints (TOC)

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Time buffer

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Time standard

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Tolerance

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Tolerance limits

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Transfer batch

Sets the pace of production to match the rate of customer demand and becomes the heartbeat of any lean production system. It is computed as the available production time divided by the rate of customer demand. For example, assume demand is 10,000 units per month, or 500 units per day, and planned available capacity is 420 minutes per day. The takt time = 420 minutes per day ÷ 500 units per day = 0.84 minutes per unit. This takt time means that a unit should be planned to exit the production system on average every 0.84 minutes. Syn.: tact time.

A storage point located upstream of a work station, intended to make it easier to see customer requirements.

Protection against uncertainty that takes the form of time.

A holistic management philosophy developed by Dr. Eliyahu M. Goldratt based on the principle that complex systems exhibit inherent simplicity. Even a very complex system comprising thousands of people and pieces of equipment can have, at any given time, only a very, very small number of variables—perhaps only one, known as a constraint—that actually limit the ability to generate more of the system's goal.

Allowable departure from a nominal value established by design engineers that is deemed acceptable for the functioning of the good or service over its life cycle.

The predetermined times allowed for the performance of a specific job. It often consists of two parts, one for machine setup and one for actual running. A time standard can be developed through observation of the actual work (time study), summation of standard micromotion times (predetermined or synthetic time standards), or approximation (historical job times).

The quantity of an item moved between sequential work centers during production. See: batch, overlap quantity.

1) The upper and lower extreme values permitted by the tolerance. 2) In work measurement, the limits between which a specified operation time value or other work unit will be expected to vary. See: lower specification limit (LSL), upper specification limit (USL). Syn.: specification limits.

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Two-card kanban system

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Unplanned repair

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Upper specification limit (USL)

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Waste exchange

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Activation

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Alternate routing

Repair and replacement requirements that are unknown until remanufacturing teardown and inspection.

A kanban system in which a move card and production card are employed. The move card authorizes the movement of a specific number of parts from a source to a point of use. The move card is attached to the standard container of parts during movement of the parts to the point of use. The production card authorizes the production of a given number of parts for use or replenishment. Syn.: dual-card kanban system. See: one-card kanban system.

A change in data, a characteristic, or a function that is caused by one of four factors: special causes, common causes, tampering, or structural variation.

In statistical process control, the line that defines the maximum acceptable level of random output. See: tolerance limits.

1) Arrangement in which companies exchange their wastes for the benefit of both parties. 2) An exchange service of valuable information between generators and potential users of industrial and commercial wastes, whereby a beneficial use rather than disposal is the end result. This service identifies both the producers and potential markets for by-products, surpluses, unspent materials, and other forms of solid waste that are no longer needed.

1) The control of authorized levels of activities and inventories in a way that is instantly and visibly obvious. 2) A type of activity and inventory control used in a workplace organization where everything has an assigned place and is in its place.

A routing that is usually less preferred than the primary routing but results in the production of an identical item. Alternate routings may be maintained in the database or offline via manual methods.

Putting a resource to work.

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Availability

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Available time

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Budgeted capacity

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Capacity

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Capacity available

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Capacity control

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Capacity management

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Term
Capacity planning

The number of hours a work center can be used, based on management decisions regarding shift structure, extra shifts, regular overtime, observance of weekends and public holidays, shutdowns, and the like. See: capacity available, utilization.

The percentage of time that a worker or machine is capable of working. The formula is availability = (S - B) / S x 100% where S is the scheduled time and B is the downtime.

1) The capability of a system to perform its expected function. 2) The capability of a worker, machine, work center, plant, or organization to produce output per time period. Capacity required represents the system capability needed to make a given product mix (assuming technology, product specification, etc.). As a planning function, both capacity available and capacity required can be measured in the short term (capacity requirements plan), intermediate term (rough-cut capacity plan), and long term (resource requirements plan). Capacity control is executed through the input/output control report of the short-term plan. Capacity can be classified as budgeted, dedicated, demonstrated, productive, protective, rated, safety, standing, or theoretical. See: capacity available, capacity required. 3) The required mental ability to enter into a contract.

The volume and mix of throughput on which financial budgets were set and overhead and burden absorption rates established.

The process of measuring production output and comparing it with the capacity plan, determining if the variance exceeds pre-established limits, and taking corrective action to get back on plan if the limits are exceeded. See: input/output control (I/O control).

The capability of a system or resource to produce a quantity of output in a particular time period. Syn.: available capacity. See: capacity, available time.

The process of determining the amount of capacity required to produce in the future. This process may be performed at an aggregate or product-line level (resource requirements planning), at the master-scheduling level (rough-cut capacity planning (RCCP)), and at the material requirements planning (MRP) level (capacity requirements planning (CRP)). See: capacity management, capacity requirements planning (CRP), resource planning, rough-cut capacity planning (RCCP).

The function of establishing, measuring, monitoring, and adjusting limits or levels of capacity in order to execute the load created by all manufacturing schedules (e.g., the production plan, master production schedule (MPS), material requirements plan, and dispatch list) to achieve expected service and cost objectives. Capacity management is executed at four levels: resource requirements planning, rough-cut capacity planning (RCCP), capacity requirements planning (CRP), and input/output control (I/0 control). See: capacity planning.

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Capacity required

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Term
Demonstrated capacity

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Efficiency

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Idle capacity

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Idle time

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Labor productivity

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Term
Load

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Term
Load profile

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Proven capacity calculated from actual performance data, usually expressed as the average number of items produced multiplied by the standard hours to produce the item. See: maximum demonstrated capacity.

The capacity of a system or resource needed to produce a desired output in a particular time period. Syn.: required capacity. See: capacity.

The available capacity that is not currently required and is instead maintained to protect the system from disruptions. See: excess capacity.

A measurement (usually expressed as a percentage) of the actual output relative to the standard output expected. Efficiency measures how well something is performing relative to existing standards; in contrast, productivity measures output relative to a specific input (e.g., tons per labor hour). Efficiency is the ratio of (1) actual units produced to the standard rate of production expected in a time period, (2) standard hours produced to actual hours worked (taking longer means less efficiency), or (3) actual dollar volume of output to a standard dollar volume in a time period.

A partial productivity measure in which the rate of output of a worker or group of workers per unit of time is compared with an established standard or rate of output. Labor productivity can be expressed as output per unit of time or output per labor hour. See: machine productivity, productivity.

The time when resources (e.g., operators or machines) are available for use but are not producing product because of setup or maintenance requirements, lack of material, lack of tooling, or lack of scheduling.

A display of future capacity requirements based on released and/or planned orders over a given span of time. Syn.: load projection. See: capacity requirements plan.

1) The amount of planned work scheduled for and actual work released to a facility, work center, or operation for a specific span of time. This is usually expressed in terms of standard hours of work or, when items consume similar resources at the same rate, units of production. Syn.: workload. 2) The total cargo or contents of a shipping vehicle in weight, volume, or utilization percentage.

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Machine loading

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Manufacturing calendar

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Planned load

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Productive capacity

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Rated capacity

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Scheduled load

A calendar used in inventory and production planning functions that consecutively numbers only the working days so that the component and work order scheduling may be done based on the actual number of workdays available. Syns.: M-day calendar, planning calendar, production calendar, shop calendar. See: resource calendar.

The accumulation by workstation, machine, or machine group of the hours generated from the scheduling of operations for released orders by time period. Machine loading differs from capacity requirements planning (CRP) in that it does not use the planned orders from material requirements planning (MRP) but operates solely from released orders.

In theory of constraints, the maximum of the output capabilities of a resource (or series of resources) or the market demand for that output for a given time period. See: excess capacity, idle capacity, protective capacity.

The standard hours of work required by planned production orders.

The expected output capability of a resource or system. Capacity is traditionally calculated from such data as planned hours, efficiency, and utilization. The rated capacity is equal to hours available × efficiency × utilization. Syns.: calculated capacity, effective capacity, nominal capacity, standing capacity.

1) An overall measure of the ability to produce a good or a service. It is the actual output of production compared with the actual input of resources. Productivity is a relative measure across time or against common entities (labor, capital, etc.). In the production literature, attempts have been made to define total productivity where the effects of labor and capital are combined and divided into the output. One example is a ratio that is calculated by adding the dollar value of labor, capital equipment, energy, and material, and so forth and dividing it into the dollar value of output in a given time period. This is one measure of total factor productivity. See: efficiency, labor productivity, machine productivity, utilization. 2) In economics, the ratio of output in terms of dollars of sales to an input such as direct labor in terms of the total wages. This is also known as single-factor productivity or partial-factor productivity.

The standard hours of work required by scheduled receipts (i.e., open production orders).

1) Information detailing the method of manufacture of a particular item. It includes the operations to be performed, their sequence, the various work centers involved, and the standards for setup and run. In some companies, the routing also includes information about tooling, operator skill levels, inspection operations and testing requirements, and so on. Syns.: bill of operations, instruction sheet, operation chart, operation list, operation sheet, route sheet, routing sheet. See: bill of labor, bill of resources. 2) In information systems, the process of defining the path a message will take from one computer to another computer.

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Start date

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Theoretical capacity

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Utilization

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Yield

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De-expedite

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Term
Expedite

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Job enlargement

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Job enrichment

The maximum output capability, allowing no adjustments for preventive maintenance, unplanned downtime, shutdown, and so forth.

In project management, the time an activity begins. It may be defined as an actual start date or a planned start date.

The amount of good or acceptable material available after the completion of a process. It is usually computed as the final amount divided by the initial amount converted to a decimal or percentage. In manufacturing planning and control systems, yield is usually related to specific routing steps or to the parent item to determine how many units should be scheduled to produce a specific number of finished goods. For example, if 50 units of a product are required by a customer and a yield of 70 percent is expected, then 72 units (computed as 50 units divided by .7) should be started in the manufacturing process. Syn.: material yield. See: scrap factor, yield factor.

1) A measure (usually expressed as a percentage) of how intensively a resource is being used to produce a good or service. This measure compares actual time used to available time. Traditionally, it is calculated as the ratio of direct time charged (run time plus setup time) to the clock time available. Utilization is a percentage between 0 percent and 100 percent that is equal to 100 percent minus the percentage of time lost due to the unavailability of machines, tools, workers, and so forth. See: efficiency, productivity. 2) In theory of constraints, activation of a resource that productively contributes to reaching the goal. Over-activation of a resource does not productively utilize a resource. 3) In warehousing, the consolidation of several units into fewer larger units to reduce handling. See: available time.

1) To rush or chase production or purchase orders that are needed in less than the normal lead time in order to move in the delivery date. 2) To take extraordinary action because of an increase in relative priority. Syn.: stockchase.

The reprioritizing of jobs to a lower level of activity. All extraordinary actions involving these jobs stop.

An extension of job enlargement in which the number of tasks that an employee performs increases and the employee has a corresponding increase in the control over those tasks. See: job enlargement.

An increase in the number of tasks that an employee performs. Job enlargement is associated with the design of jobs, particularly production jobs, and its purpose is to reduce employee dissatisfaction. See: job enrichment.

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Job rotation

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Manufacturing order

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Work order

A document, group of documents, or schedule conveying authority for the manufacture of specified parts or products in specified quantities. Syns.: job order, manufacturing authorization, production order, production release, run order, shop order, work order. See: assembly parts list, batch card, blend order, fabrication order, mix ticket, work order.

The practice of an employee periodically changing job responsibilities to provide a broader perspective and a view of the organization as a total system to enhance motivation and provide cross-training.

1) An order to the machine shop for tool manufacture or equipment maintenance. This is not to be confused with a manufacturing order. Syn.: work ticket. 2) An authorization to start work on an activity (e.g., maintenance) or product.